Digital Ecosystems and Business Intelligence (DEBI) Institute
Curtin Business School

Bio-inspired SME Business Strategy Enriched by Convergence of Epistemology, Neurobiology and Cognitive Psychology

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This thesis is presented for the Degree of
Doctor of Philosophy
Curtin University

August 2014

DECLARATION

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature: 

Date: 30th July 2014

ACKNOWLEDGEMENTS

I first thank the Spirit for the guidance and sustenance in uncovering the bio-inspirational concepts and approaches to manage knowledge and wisdom for the benefit of all stakeholders involved with Small Medium Enterprises (SMEs).

To Professor Elizabeth I acknowledge my deep felt gratitude and appreciation for the insightful and professional assistance that has been of vital and strategic importance in my research project. She has been the primary inspiration and motivation of my research efforts to generate a deep epistemic understanding of the bio-inspirational paradigm. I specifically acknowledge Professor Elizabeth's thought- provoking re-framing of my early research into what I believe is an exciting paradigm for future academic intervention. I continue to be amazed by and I will be always grateful for her support in continually challenging my thinking to reach the next level of advance.

To Dr Farookh Hussain, a key member of Professor Elizabeth's team, I owe a deep sense of gratitude for the encouragement, with his patient and real-time responses to the intellectual break-outs that I kept regularly making to him, in hour long phone conversations during the progress of my research. To Dr Chan Cheah I also express my gratitude for her support and knowledge and for introducing me to DEBII, I will always be grateful to DEBII for the nuturing and supportive research and training environment. Showered with innovation, initiatives and energy by its Director Professor Elizabeth, it has inspired me to continue my trans-disciplined research ideas, despite their unique challenges and to finish this thesis.

I am grateful especially to Professor Peter Ellyard who patiently listened and encouraged me on this journey with advice to go beyond knowledge management and to focus on the concept of wisdom in strategy-making. To Mr Dean Marchiandi I will always be grateful for his support and his demonstration of wisdom in action. I am also grateful to Mr Les Leckie who introduced me to the concept of business networks in action.

I also acknowledge with gratitude the knowledge and opportunity presented by Mr Max Coulthard of Monash University who introduced me to the concept of strategic thinking and the importance of its role in academic intervention. To the management of the educational institutions and to all my students I also make a grateful thank you. You presented me with the opportunity of an active testing ground for the presentation and analysis of my new concepts and approaches to strategy-making in curriculum applications at the diploma, advanced diploma, under-graduate and post-graduate levels.

Finally I reserve my utmost gratitude, deepest appreciation, and enduring admiration to my immediate and extended family for their trust in me and their vital support all throughout this long journey. I am totally indebted to my wife and life partner Larraine, and to my children Kevin, Roger, Michael and Ellyse. In very important ways, they unbelievingly continued the same encouragement and motivation that was provided to me by my parents Albert and Cecelia. To all of them and to the other members of my friends and business associates, I say an ever grateful and a big thank-you.

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EXECUTIVE SUMMARY

The Project addresses the development of an innovative bio-inspired solution for **SME** (Small Medium Enterprises) to overcome the problems preventing SME success in the global economy. The Proposed solution is inspired by the DNA-studies in Human Biology and break-through Stem-cell research, regenerative medicine, tissue engineering; and presented with the strategy-making epistemologies and its scientific foundation based on the "functional elements" that generate the bio-chemical strategies for human life and its analogy to SME development.

The proposed research in this thesis has explored Nature's system of knowledge management and wisdom management and an epistemic bridge has been developed. Also the case study has been presented for the use of a parallel portfolio of "epistemic conditions of state" that can facilitate correlates of Nature's strategy-making mechanisms. The correlates involve a portfolio of lexical terms that have been identified and selected to function as meta-level strategy-making catalysts similar to Nature's functional elements. It is also argued that the lexicon's catalytic functionality can deliver managed convergence of epistemologies with all previous strategy-making resources. The combination of the bio-inspired catalysts and the epistemic-bridge-model offers SMEs a platform that can help recruit business for ecosystem membership, deliver a renaissance in Pre-2000 era thinking, and deliver Schumpeterian innovation through creative destruction.

SMEs seeking to utilize conventional strategy-making approaches have been confronted by structural barriers that limit the utilization of 100 years of **MNC** (Multi-National Corporations) focused strategy-making studies from academia. The Information Tsunami nature of reports from technology, and the disciplines of knowledge management and innovation management have equally challenged SME participation in the phenomena of the global economy. A radical change in mindset is required for SMEs to break-away from their legacy-based and building-bloc-centric perspectives on strategy-making. Post-2000 relevant strategy-making needs a paradigm-shift of the same type which has transformed DNA-studies in Human Biology. The new landscape of DNA researchers, MNCs and SMEs have gone beyond their Pre-2000 focus on the 1.8%DNA component of protein-coding genes. What was originally labeled as dark DNA and junk DNS is now the acknowledged initiator, controller and delivery system of all strategy-making and the management of the 100 trillion cells that make up the human life-form.

Having established the catalytic potential of the bio-inspired parallels, the Research subjected its operational model to tests its validity and epistemic grounding on the theories of Pre-2000 and Post-2000 strategy-making studies. It successfully demonstrated its capacity to automatically facilitate convergence among the disparate legacies, domains, origins, and resources that were hitherto considered SME barriers. In keeping with the scientific method, the framework was also successfully subjected to conceptual, perceptual and practical test criteria. Importantly after each test, the validated scale and scope of the bio-inspired mechanisms have uncovered even further justification for its adoption at even deeper levels beyond metaphoric parallels. The common DNA grounding of strategy-making and cognitive mentation processes have provided the model with scaffolds of support from the scientific fields of neurobiology of the Mind, the Brain,

behavior and cognitive psychology. The uncovering of the new epistemic landscape of support is further justified by the on-going availability of scientific research findings in Systems Biology, Neurobiology, Opto-genetics and Neuro-economics.

Importantly for the SME, the proposed Bio-inspired Model use of the catalytic lexicon and its epistemic bridge and presented with the higher level scientific understanding and elevated the Mind for higher order thinking and relationship building, for pattern generation, innovation priming, and knowledge embedding even within the minds of machines created with this strategy-making framework, which will enables SMEs to overcome the barriers through innovation and to become Emerging Global Industry (**EGI**) or be part of Emerging Global Industry Development (**eGID**).

CHAPTER 1 – SME DILEMMA – FROM SME TO EGI

1.0 Introduction

In this Chapter we outline the SME challenges as to confronting a mariner needing to navigate the ship of business through the chaotic conditions that represent the complexities of the global business landscape. The general issues and the motivation of the study, at the end of the thesis, we give an outline of the proposed thesis Chapters.

1.1 Definition of Terms and Concepts used in this Thesis

In this section, we give some of the terms and concepts used in this Chapter and the thesis.

SME - is defined as Small Medium Enterprises

MNC - is defined as Multi-National Corporations

EGI - is defined as Emerging Global Industry

eGID - Emerging Global Industry Development

PESTE – a Macro-economic principals

P – represents Political forces
E – represents economic forces, trends, and business environmental issues
S – represents the social issues that impact on the business environment
T – represents the Technical issues, and
E – represents the Environmental issues and factors of the physical environment and issues of sustainability.

IR-Grid – Integration–Response Grid is is the conceptual framework presented by two leading strategy professors – Prahalad and Doz. They have indicated that the demands of the Global Economy can be mapped to be a 10-10 I_R Grid. On a scale of 10, each represents the degree of integration of knowledge (Y-axis) and the degree to which knowledge is used for satisfying the local demands of customers (X-axis). Figure 1.1 and 1.2 of this Chapter present the conceptual view with its sole focus on the SME seeks to achieve the I-R Grids (10,10) coordinate by gaining the required knowledge and skills to enhance existing levels to the 10,10 status on the I-R Grid.

Pre-2000 - is defined to represent the era during which strategy – making models and concepts were created. In the academic context, this era is assumed to commence nearly 100 years ago by business management thought-leaders such as FW Taylor and Henry Ford of the Ford Motor company. Post-2000 is defined to represent the new case study business models and approaches that were created in the new 21st century.

Strategic making is defined as the thought-out position that firms need to become competitive in the long term

SME Strategy Making is defined as the corporate organizational, resource-defined and epistemic positioning created by an entity to guide its future growth, profitability and long term sustainability **Global Knowledge base** is defined as the accumulation of knowledge, expertise, skills and strategies that are embedded within and which characterize the participants in the global economy

1.2 The Background

Governments around the world are keen to assist their local SMEs to participate in the global economy. There are however significant difficulties in achieving the expected success because SMEs lack the required strategy-making capacity. Difficulties arise from the simplistic expectations that SMEs can easily achieve the required strategy-making capacity through conventional approaches and by simply increasing the volume and level of business concepts and models for adoption and innovation success. Additional problems confront SMEs with the need for a new group of cognitive resources to manage the dynamics of the global economy changing knowledge-content, knowledge-based packaging, and the knowledge-delivery systems are increasingly characterizing the global economy and in turn imposing new demands for global success.

As stated in the introduction above, in global economy, SMEs need to navigate the ship of business through the chaotic conditions and the complexities of the global business landscape. The metaphor confirms the inadequacy of merely making knowledge-content available a greater volumes, despite the each of the required cognitive and emotional skills necessary to utilize the tools. Questions also arise as to whether the inadequacies of knowledge-delivery infrastructure can continue with its singular reliance on conventional education and learning systems.

We present the case that the business-related chaos resident in the global business landscape is the result of the new epistemologies of the global mindsets. We agree that this can be traced to the driving force of an integrated supply-demand nexus with knowledge in action, from around the globe, which stems from knowledge flowing from different feeder and “mind-set” domains. It is in this context that the Chapter concludes with the need to examine the potential offered by the 4 specific epistemic domains of Academia, Industry, the Knowledge Management Movement and the Innovation Management Movements.

This research focuses on the resolution of these difficulties with the planned development of a research framework which is grounded on the common epistemic principles catalysing the SME barriers, as illustrated in Figure 1.1.

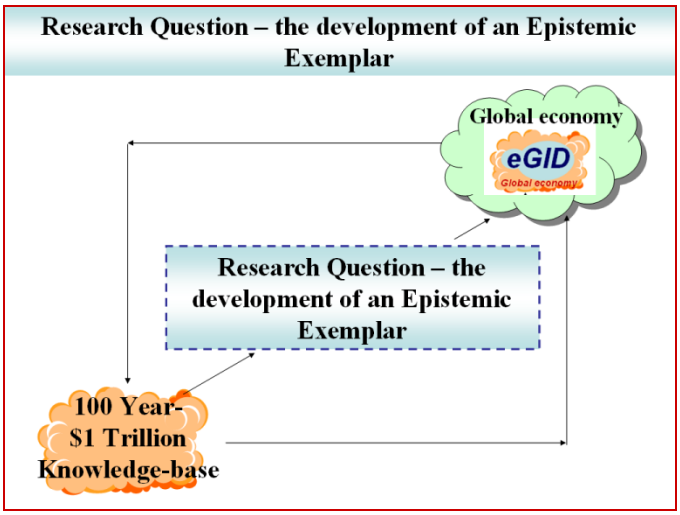

Figure 1.1 – Epistemic landscape for SMEs and global business strategies

Figure 1.1 seeks to illustrate the relative differences in the epistemic positions of the different corporate entities that form part of the global economy. The position of the corporate entitles are mapped against the acclaimed Integration-Local Response (IR-Grid) proposed by two leading strategy professors – Prahalad and Doz. The mapped IR-Grid indicates that the demands of the Global Economy can be considered to be a 10-10 mark on a scale of 10 each for the degree of integration of knowledge (Y-axis) and the degree to which knowledge is used for satisfying the local demands of customers (X-axis). Figure 1.1 with its sole focus on the SME seeks to achieve the I-R Grids (10,10) coordinate by gaining the required knowledge and skills to enhance existing levels to the 10,10 status. Figure 1.2 presents the same I-R Grid, but with the additional entities that are seeking to achieve the same "10,10" coordinate position, representing success in the emerging Global Industry Development (eGID) sector. Multi-national firms have relatively high degree of integration and utilize their own range of strategies to deliver high levels of local response. The position of Trans-National Corporations on the IR- Grid strives to implement the catch-phrase of "think global-act-local" with a 10-10 score. By contrast "Global" firms develop a small range of globally required products and stay focused on the 10-1 region. This is characteristic of some OEMs who focus on their technology and product innovations and rely on local agents to deliver the Local Response on behalf of the OEM. SMEs and chains of SME (termed as Multi-Domestics) are located on base of IR-Grid. Their knowledge abounds in the needs and experiences of local markets. The shortage of resources on the base-line of the IR-Grid is typical of the SME and it is in stark contrast with the resources of the MNC-TNC-Global firm.

SME – strategy making is being conducted in this context – i.e. the need to cross the epistemic divide that confronts SME's to a much greater extent than Multinationals, Global companies or Transnational corporations.

1.3 Business context in emerging global economy

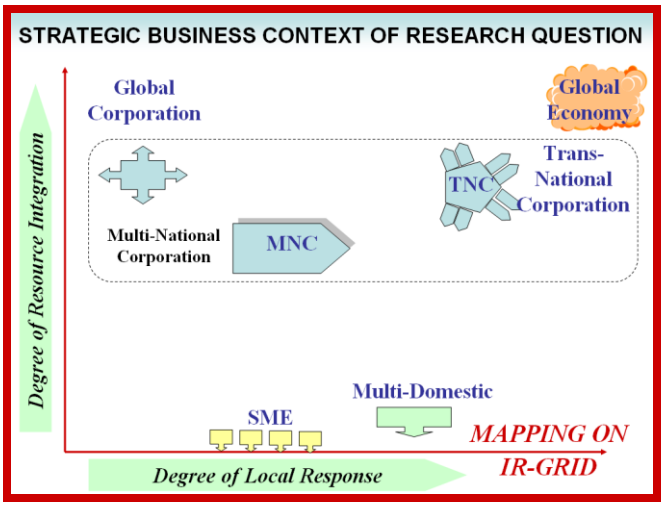

Figure 1.2 – Epistemic positions of SME and other entities who make up the global economy

Figure 1.2 explains the challenges faced by SMEs relative to the other entities that make the emerging global economy. The IR-Grid, as it is generally known, consists of the X-axis representing the degree to which firms need to be actively connected with their clients. Termed as Local Response, the greater the extension represented n the X-axis, the greater will be the degree of knowledge and awareness of the needs of clients. Firms high on the Local Response scale are characterized by activities that deliver a high degree of corporate response to their client needs. Such firms are also expected to possess a high degree of knowledge of the operational factors and the limitations of their client and their expectations. The native position for SME's on the X-axis of IR – Grid is relatively high. It results from the geographic, physical and emotional proximity and strength of relationships between SMEs and the local communities being serviced.

The Y-axis by contrast represents the degree to which the firm's systems and activities are coordinated and integrated. A firm exhibiting a high degree of integration of its infrastructure and Value Chain activities for example is expected to be able to deliver cost-savings with benefits from economies of scale and tightly managed global supply chain fulfillment.

The IR-Grid therefore can represent the different types of firms based on their propensities to respond to the needs of local clients or the degree of their system integration. SMEs for example are generally close to their clients, almost always interacting with other SME-owners at the CEO and owner level. The business relationships at the high Local Response level are most times personal to the extent that the service-delivery firm possesses unique knowledge of the expectations and the management of the business being serviced. SMEs however lack the infrastructure and the at-source production systems or the "original products" that are on-sold or value added. Hence SME firms are more likely to rate low on the Degree of Integration (Y-axis).

By contrast, larger firms such as Multi-National Corporations (MNCs), Transnational Corporations (TNCs) and Global Corporations rely on high degree of integration of their entire

value chain system, however globally and geographically dispersed it might need to be. Their reliance on Standard Operating Procedures hierarchies are indicators of the tight integration. With the role of business strategy-making being the responsibility of management at the highest level of the hierarchy, the resulting strategy is relatively remote from the customers being serviced. Customization of products and services for regional markets for example may not be possible when economies of scale are linked to the delivery of generic versions or global products. The Local Response criteria for example could be relatively low, and sacrificed in order to deliver the required profit margins from volume sales.

Finally sitting at the right top of the IR-Grid, (on a 10-10 Scale on the X-Y axis) is the Emerging Global Industry Development sector (eGID). This sector demands the products and benefits from the highest levels of Local Response and business system Integration.

The first strategic challenge for SMEs is therefore to transform themselves from their High Local Response – Low Integration to a level of High Response and Integration. MNC firms continually battle with this duality, only from the opposite side of high-integration but with low Local Response.

The second strategic challenge for SMEs relate to being aware of the need for the creation, transformation, development, and funding of the 100 year- $1 Trillion knowledge-base to overcome the epistemic distance in the IR-Grid.

The third strategic issue is the manner by which SMEs can develop strategies by using the 100 year- $1 Trillion knowledge-base which has largely been developed to satisfy the IR-Grid challenges that are specific to the structural position of MNCs, TNCs and Global Corporations. This is explained further in figures 1.3 and figure 1.4.

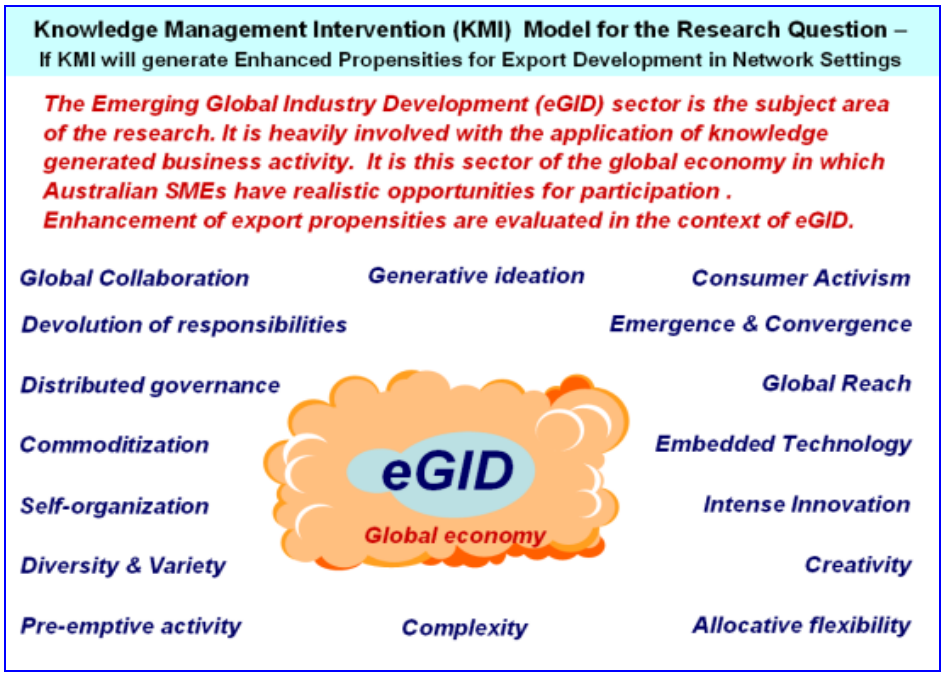

Figure 1.3 – Complexity challenges confronting SME strategy-making

Figure 1.3 seeks to represent the complexities of the global economy with which SMEs must engage if they are to achieve sustainability. Included with the diagram are the names of some of the disruptive influences and the observable characteristics of the global economy. A key issue in the diagram is the acknowledgement that the intensity of the dynamics is fuelled by new knowledge, with new approaches, new players, and new technologies.

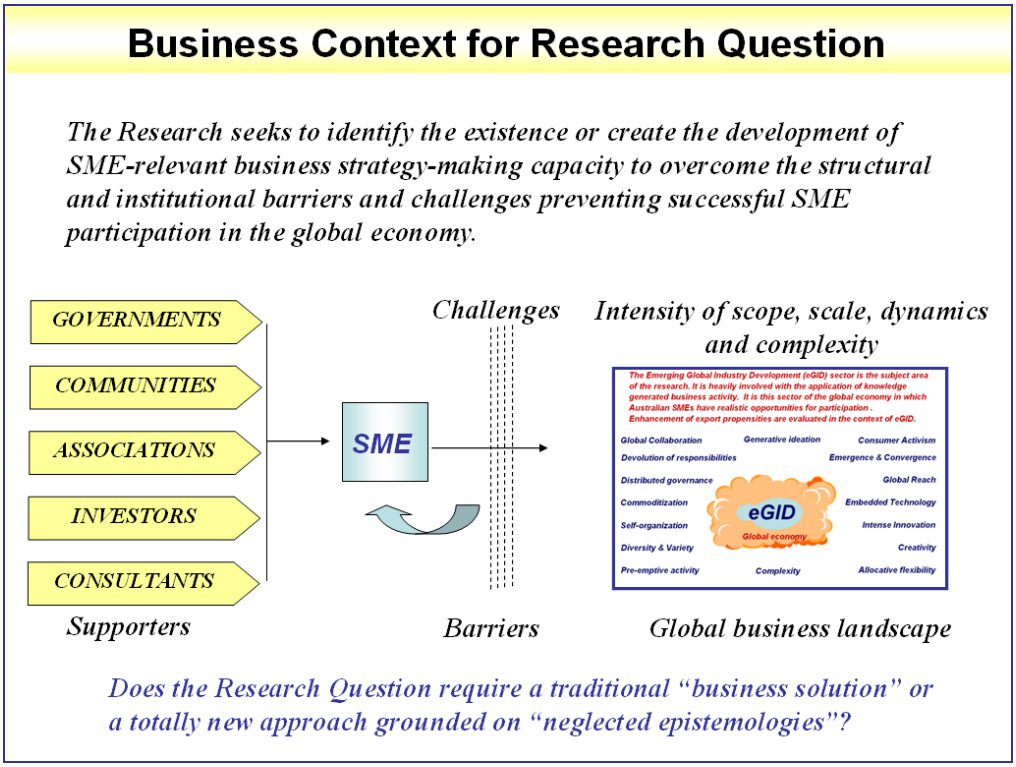

Figure 1.4 – Integrated framework for SME strategy – making research

Figure 1.4 illustrates the context of the Research Project that seeks to develop a strategy-making framework or model that possesses universal appeal. The diagram shows that SMEs are expected to participate in the global economy in accordance with the support and expectations of Governments and other stakeholders. At the right of the diagram is the icon of the global economy and the complexities within that make it difficult for successful SME participation.

Figure 1.3 attempted to illustrate the fullness of the eGID issues that have been "shrunk" within the right side of the diagram.
The shrunken "eGID" symbol in Figure 1.4 seeks to explain the dynamic nature of not only eGID but also of the other issues to which they are linked. For example on the extreme left, the dynamic forces of support, expectation, regulation and facilitation from government, communities, agencies and investors, etc are illustrated. These represent the expectations and the demands placed on SMEs for relevant strategy-making and contributions of success to their native economies.
SMEs as illustrated are indeed in the middle, caught between these demand-expectations and the reality of the eGID's complexities.

1.4 Economic Context for the Global Economy

The Research Project recognises the existence of a strategic factor that needs to be considered in the SME context involving the I-R Gird, eGID and Multinational Corporation.

Figure 1.5 seeks to illustrate this strategic factor – that for the past 100 years MNCs have been a massing knowledge, learning, skills and expertise in order to achieve the IR-Grids (10, 10) coordinate at the eGID position.

This knowledge-base is growing exponentially in the Post-2000 era, and is now being called the "Information Tsunami".

The Research Project recognises that if SME strategy – making is to succeed in creating a smart pathway to eGID, then this massive 100 year knowledge-base and its Post – 2000 era "Information Tsunami" must be evaluated for lessons, new skills, new strategy – making frames, etc.

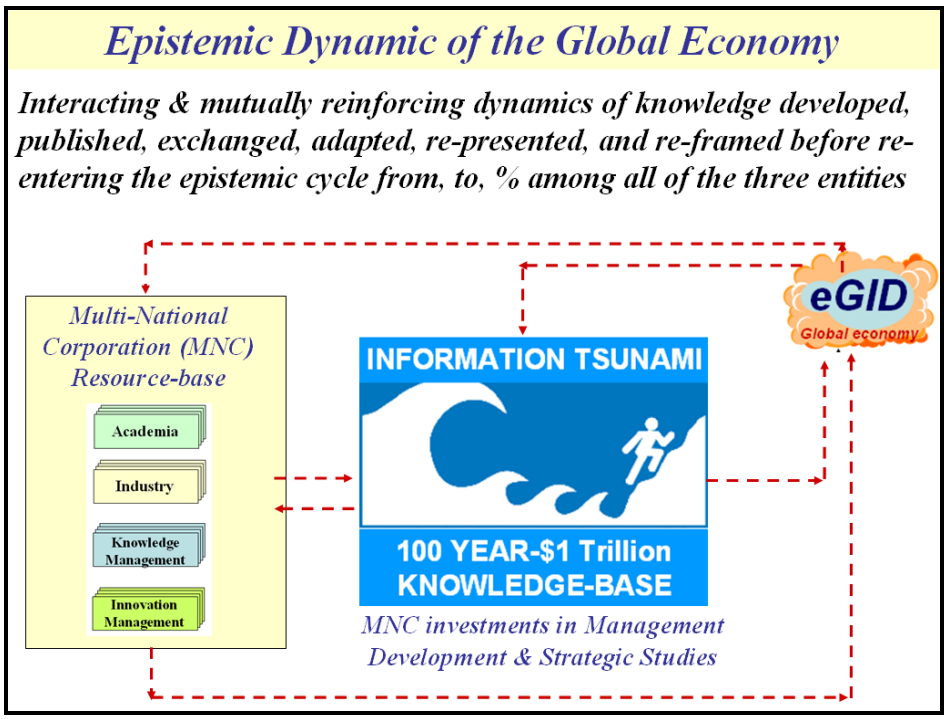

Figure 1.5 – The context of existing knowledge for SME strategy – making.

It is in this context that the Research Project has sought to identify and categorise the sources of knowledge and information contributing to the 100 year – Information Tsunami.

The left of the diagram of Figure 1.5 presents these sources as resulting from:

(i) Academic, or traditional legacy – based and theoretically oriented models and concepts.

(ii) Industry-generated knowledge that focuses on "Technology" and the productivity gains that continue to be reported upon in the Post – 2000 era.

(iii) The knowledge management movement with its focus on engaging the cognitive skills and analytical disciplines, and

(iv) The Innovation Management movement that seeks to establish a direct pathway to eGID by a focus on innovation.

If SME strategy – making is to successfully establish an epistemic pathway for innovation and the creation of new business opportunities, then this Pre-2000 and Post-2000 knowledge base and its contributing sources need to be reviewed and evaluated for possible lessons.

1.4.1 Government expectations

99% of enterprises in the European Union, for example, are SMEs with some 23 million SMEs providing approximately 75 million jobs.

Government expectations for SME success and participation in eGID (as illustrated in Figure 1.4) are based on several f1.actors, as detailed further.

(i) SMEs are acknowledged as the business – sector group that has the greatest impact on local employment. SME successes have been directly correlated to employment growth.

(ii) SMEs are recognized as an important source of innovation. The innovating "Mind" of the individual is the common epistemic factor for innovation sparking – irrespective of whether the individual is an SME or an employee of a MNG.

(iii) The epistemic freedom of the SME and the individual's "Mindset" are also acknowledged as a more productive source for innovation. The term "shrink – works" has been proudly linked to the success of several MNC grants including HP.

(iv) Government's hope that SME innovations can lead to the eventual creation of larger corporate entities and the eventual creation of global businesses that would remain anchored to their original nature land, and

(v) Governments have invested heavily in education and training, and the benefits from local SMEs are considered to be a part of the economic dividend.

The research by Baumol (2005) confirms the important role played by SMEs in the development of break-through innovations. Baumol notes that a disproportionate share of breakthrough innovations has been generated by independent inventors, entrepreneurs, and small or start-up firms. In contrast the "Goliath" MNC firms are largely associated with either incremental innovations, or enhancing the break-throughs developed by their mini-sized "Davids". These findings resulted from the examination of 193,976 patents in the USA.

The emerging Global Industry Development (eGID) sector is however characterized with its high velocity of customer value propositions, convergence of technologies, divergence of fashion, economies of ideation, and migration of economic boundaries demand revolutionary type innovations. Incremental innovations are of less value to eGID because they represent improvements on business models which may be on the pathway of extinction or irrelevance. Break-through or revolutionary innovations are therefore the needed response to eGID. Furthermore Baumol (2005) confirms that the innovations of smaller firms feed the innovation engines of the large multi-nationals, who then perform routine innovation before market release. In several cases Baumol reports that these small corporate innovators were former members of the MNCs, who departed because their heterodox ideas were an ill-fit with the incremental processes of the MNC.

Quoting the US Government's Small Business Administration as the source, Baumol (2005) provides a list of the range of innovations attributed to SMEs – from heart valves, to stobe lights, to stereoscopic maps, hydraulic brake systems, kidney stone laser treatment, bio-magnetic imaging, computerized blood pressure controllers, human growth hormones, etc. Reflection and analysis of the list confirms the important role that SMEs provide in society – beyond their well documented function of providing more local jobs than the MNCs.

Based on these objectives alone, the Knowledge Ecosystem Models attempt to spark creativity among SMEs and transfer and interpret the contexts of the emerging Global Industry Development (eGID) sector are therefore justified.

1.4.2 The Historic perspective

The Post – 2000 era presents a further and compelling perspective on SME – created innovations and their potential to catalyze economic growth and a spiral of development.

Most of the largest firms on the New York Dow Jones Index and the NASDEQ have achieved their mega status from humble SME – beginnings barely 30-40 years ago. Examples include Google, Facebook, Microsoft, Apple, SAP, Saleforce.com, and others.

From this perspective, the research efforts of this Project can therefore be argued to address an issue of economic, cultural, social, and technological importance.

1.5 Emerging Global Industry Development (eGID)

1.5.1 Innovations are driven by knowledge & collective effort

In the mid 20th century, Joseph Schumpeter credited to be the father of innovation in economic theories, argued that the primary role of any business is to progressively innovate and creatively destroy the replaced innovation. It is argued that SMEs are effectively confronting the reality of Schumpeterian innovation on a global scale, as it emerges with full visibility of the complexities

and technologies that characterize and are embedded within new products, new processes, new delivery systems, new markets and new business models.

1.5.2 The increased knowledge gap

Within eGID knowledge is doubling (in some estimates as rapidly as every 18 month) at an enormous rate. According to Olsson 2000, econometric models have been developed at rates first predicted by Joseph Schumpeter in 1934. They are underpinned by the growth factors of:

(i) Old ideas are combined to give new ideas
(ii) When knowledge growth curves appear convex in shape, paradigm shifts occur before the next spurt in growth takes place
(iii) Knowledge sets are different across individuals, countries and time periods and each contributes to the growth equation
(iv) Growth of knowledge within countries has two sources – diffusion from other countries and its own production
(v) The engine for global knowledge growth is the recurrence of paradigm shifts
(vi) Idea gaps contribute to the development of paradigm shifts in thinking.

The research implications of this concept are twofold:
(i)SME strategy making cannot ignore or neglect the important knowledge-growth dynamic if SMEs are to function in the eGID sector, and
(ii) SMEs are in need to invest in the concept of an epistemic paradigm shift if SMEs are to boost their knowledge-base and if they are to understand the changes taking place in the knowledge intensive eGID landscape.

1.5.3 Impacts visible, causes are hidden

In the emerging global business domains, the causes, the processes, and the mechanisms that generate Joseph Schumpeter's creative destruction are hidden away. All that is known is the impact or the pronouncements of new products being relentlessly presented to the global customer. SMEs are aware that this is the tip of the proverbial iceberg and the fears of the unknown are a factor in the challenge to their mindsets.

1.5.4 Meta-strategy-making capacity in SME

In the Research Project's evaluation of eGID and of strategy – making resources presented in the Literature Review in Chapter 2, the argument can be made that no single, clear "SME-to-eGID" pathway strategy exists.

Neither does any "meta-strategy" exist that can be used to selectively "Mix-and-match" a ready-to-use SME strategy for eGID participation.

The Research Project however recognizes that these limitations directly apply to the knowledge – base that has been associated and created by the business studies domain.

It is in this context, that the Research Project will seek to look at adjacent domains in the search for a ready-to-use direct or meta-strategy.

1.5.5 The New Century Biology in the Context of Emerging Global Industry Development (eGID)

The SME challenge of the unknowns in the emerging global landscape can be highlighted by statements of leading scientists such as Professor Freeman Dyson and his prediction that the 21st. century will be the Century of Biology. The 20th. Century was the Century of Physics with nuclear power, and atomic physics including Quantum Mechanics and the digital revolution. Already the level of resources expended in bio-tech research exceeds the research in funding of the disciplines of physics

"Biology" as a discipline is now bigger than physics, as measured by the sizes of budgets, workforce, economic consequences, ethical implications, and output of major discoveries on human welfare. Also biology is likely to remain the biggest part of science through the twenty-first century.

The lessons from this distinguished scientist, technologist and educator is that strategy-making too should look towards the science of biology for lessons and benefits that no other technology can offer. It can be further argued that the concept of bio-mimicry should be investigated to determine if any potential exists for a contribution to strategy making.

Justification of bio-mimicry as a subject worthy of this Research Project is grounded in the wellspring of Professor Dyson's knowledgebase on the historic perspectives and paradigm shifts that have transformed human thought and lifestyle. For example Professor Dyson observes that it took "three generations of misery" for the lessons of the industrial revolution of harvesting the benefits of coal and iron utilization. By contrast Professor Dyson observes that the technology of micro-chips and computer software have largely been achieved within a single generation. Following this logic, the predicted benefits of his "Biology Century" cannot be ignored.

New paradigm of "21st century of Biology" appears to be the natural follower of the agricultural and industrial revolutions, and the Information Technology revolution and the Knowledge Revolution. The question can be raised whether eGID's velocity and complexity is a manifestation of Biology – generated "Mind-sets".

Also the question needs to be posed whether the Knowledge gap (which requires managing the Supply-Demand Gap and the Innovation-eGID participation gap) can be resolved with 21st century Biology – generated perspectives and solutions.

1.5.6 The Concept of Emerging Global Industry Development (eGID)

One of the foundational concepts of Pre – 2000 strategy making studies is the macro – economic forces that SMEs and all business entities need to address.

The macro – economic forces have been conveniently referred to as PESTE forces, where:
P – represents Political forces

E – represents economic forces, trends, and business environmental issues
S – represents the social issues that impact on the business environment
T – represents the Technical issues, and
E – represents the Environmental issues and factors of the physical environment and issues of sustainability.

These macro–economic PESTE forces are directly applicable to the Post–2000 era in a manner totally different from PESTE effects on the Pre– 2000 era.

Table 1.1 provides a summary of the new Post – 2000 macro – economic forces that are defining, characterizing and transforming the eGID business environment.

Macro-economic Forces	Epistemic driving mechanisms contributing to the complexities and the intensity of change in the global economy
Political	Political globalization with agreements reached on the reduction or removal of trade barriers Reduction or removal of tariffs on goods imported into countries Removal of licence systems preventing non-resident firms from entering into protected sectors, that were earlier protected from external competition Degree of support from Government for nurturing new industrial growth
Economic	Operating conditions that differentially appeal to investment in global and local manufacture, assembly, or gateway functioning Access to local human resources Access to land and financial resources Availability of investment funding Incentives for investment in nations or specific industry sectors Exchange rates controlling the importation or export of goods or transfer pricing Level of technology in host countries per the Michael Porter Diamond As above for local competition levels Size of the local consumer base Levels of infrastructure for production systems
Social	Capacity of the global and local populations to support the investments Capacity to accept new trends in consumerism Willingness to follow global trends Degree of trend setting Willingness to learn Degree of insularity or openness Instant global communication

Technical	Capacity to generate innovations in concepts Capacity to integrate technologies Web technologies Internet technologies Cloud computing Micro-electronics Nano technologies Biotechnology Bio-medical
Environmental	Regulatory regime/ sustainability / climate change Opportunities for remediation and rehabilitation of earlier industrialization

Table 1.1 – The macro – economic PESTE forces that are shaping the chaos of eGID

In defining the target business landscape the Research Project does not involve mass production or bulk mining or bulk agriculture or high technology of the Intel or SMTechnologies. We focus on the focus on the concept of eGID –because it is the sector that is involves significant contributions from SMEs who are transforming themselves to function in the knowledge economy sector that is exposed to the full opportunities and challenges of PESTE globalization. The complexity and the general inadequacies of SMEs to cope with the eGID complexities can be limited to parallel problems with managing the PESTE forces.

SMEs therefore need to know the mechanisms behind the intensity of change taking place in the PESTE technologies, business models, distribution channels, and levels of competition. Without this knowledge, any strategy making will only be addressing the symptoms and not the driving forces. Strategy-making to be relevant must address these PESTE driving forces with options and solutions that need to be innovative and sustainable.

1.6 Need for SME to manage eGID participation

Research by SubbaNarasimha 2001 has characterized the eGID sector with intense levels of turbulence that requires a separate strategic theory of the firm. SubbaNarasimha argues that new approaches to knowledge are required to make strategy-making a success for participation in eGID. SubbaNarasimha builds the case that this new knowledge needs to both understand the multidimensional nature of eGID, and recognize that:

- On the supply-side, the abundance of technologies being made available is increasing;
- several technological methods are available for the same goal achievement;
- demand-side turbulence in eGID result from customers demands that extend beyond aesthetics, or their physical or tangible nature;
- the multiplicity of means and ends result in the varying levels of ambiguity that characterizes Pre-2000 approaches to strategy making.

SubbaNarasimha 2001 further argues that strategy-making knowledge should possess distinct dimensions of knowledge – in breadth, depth, complexity, fungibility, transferability, tacitness and diffusivity across firms and industries. This knowledge needs to be esoteric, exploratory, exploitative, architectural, and generative in a variety of contexts.

The question remains whether this knowledge should replace the fundamentalist approach to strategy-making from the conceptual models and approaches of Drucker, Hamel, Prahalad, Normann, Pfeffer, Romer and other thought – leaders. Our Research argues that a combination appears necessary. A combination with, the fundamentalist or the traditional and Pre – 2000 sources of knowledge from at least:

(i) Academia
(ii) Technology in Industry
(iii) The Knowledge Management discipline, and
(iv) The Innovation Management discipline.

In addition we recognize and argue that selections of epistemic content need to be made from external disciplines and domains such as the 21st Century Biology.

1.6.1 Participation strategy for eGID

The challenge to create and manage SME strategies also needs to be addressed in the context of forces that are causing the "chaos" within eGID. Characteristics identified by scientifically – based and cross – discipline of Complex Adaptive systems confirm that eGID's transformations result from the intervention of Post – 2000 knowledge and its generative mechanisms of:

- Convergence,
- Divergence
- Emergence
- Transvergence

these goes beyond interdisciplinary cooperation but with retention of discipline boundaries. Transvergence by contrast melds the inter-disciplines into a trans-disciplined landscape with seamless functionality and utilizations without ideological boundaries such as limits on proportional cost compared to total costs, levels of resident risk, the need to retain scientific approaches, etc Intersections, integrations, and common relationships build new identities, with rather distant linkages to the originating and foundational systems

eGID therefore as the interaction between the "Legacy based" Pre-2000 and Post-2000 knowledge-based forces of being unleashed in the global economy with the core activities of any firm – ie. the management of its Porter type Value Chain. The interaction produces unlimited combinations. The power and potential for the mixing of Pre-2000 and Post-2000 knowledge is illustrated in Figure 1.6 and Figure 1.7. For example and with the concept of the Value Chain as an anchor (Figure 1.6) it is possible to evaluate and respond to the knowledge-generated forces using knowledge-based perspectives, such as Knowledge Management Intervention model (KMI) of Figure 1.7.

1.6.2 An Industry Problem in eGID

SME participation in emerging Global Industry Development sector (eGID) is a common industry problem. For example in Figure 1.6 it can be seen that the Pre-2000 Model requires a strategy making capacity to handle the dynamics of the observed challenges and innovations to

which all firms must proactively respond if they are to successfully participate in the global economy.

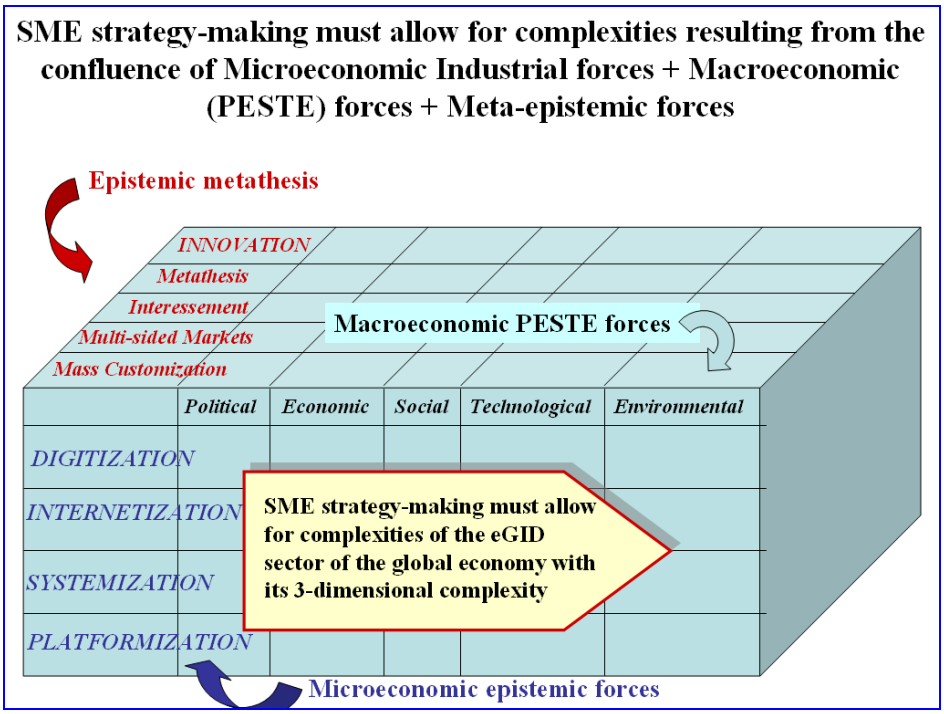

Figure 1.6 – The common industry challenge to manage eGID participation.

Figure 1.6 illustrates the visualization of the difficulties faced by all firms in their attempt to participate in the global economy. The metaphor is offered of the firms having to navigate through a 3-dimensional sea of complexity and change. This results from the combined impacts of the macro-economic PESTE forces (X-axis of the diagram), and the Micro-economic industry forces (the Y-axis of the diagram), and the nano-scale Epistemic forces (represented in the Z-axis of the diagram). All business models and innovations from the minds of global investors and entrepreneurs must negotiate a strategy that manages the chaos from the combined actions of Macro-economic, microeconomic and epistemic forces.

1.6.3 SME Challenges in eGID

The market in which SMEs operate has been in the Emerging Global Industry Development sector. eGID is unique in that it is different from those global market sectors demanding different from Economies of scale, Economies of Scope, Lowest cost segments, Cheap labour work-force engagement, Broad-based agriculture, Resource intensive industries, Capital intensive industries

eGID is characterized by "Emergence" with speed and velocity and non-linear. Disruptive technologies and new pathways are further characteristics of the emergence. Emerging

economies are global in reach – in the global sources of the product inputs, the widely dispersed manufacturing plants and assembly points, and the multiple buyers in national around the world. The 1990 New Growth Theory by Paul Romer of Stanford University has confirmed the need to move away from conventional approaches and end-of-pipe solutions, with their well lectured limitations on scale, monopoly, resource restrictions, and

Examples of the emergence factors include:
G- Global Factoring & global framing of issues – of markets, procurement, production, investors, customer preferences, global thinking and trends, global logistics

D- Digitization of content, product, services, processes, communication systems, transaction, convertibility, transformations, conversions, legitimation, authentication

I- Internet technologies linking the markets with the producers, service providers, consumers, channel partners, for collaboration, communication, knowledge

S – Sustainability – with issues of carbon impacts, emission abatement, environmental foot-print, corporate social responsibility to the environment, customer expectations, environmental activism, Non-Government and Global Government programs and initiatives, programs of global watch, transparency of activities, legislation and global agreements,

C- Culture of commerce – with global trading and integration of value chains that originate, integrate and

eGID shall attracts new suppliers, competitors, facilitators, corporate entities, resource-providers, end-users and demographic groups that have no regard for the Pre-2000 nationalistic divides. Convergence in lifestyles, tastes, and buyer decision making patterns and behaviour render strategies and approaches that are universally accepted in the Pre-2000 era to be rejected and replaced with new products and services, most of which possess no forms of earlier existence.

Economic factors such as the development of new buying power capacities, global logistics capabilities, and new agreements on tariffs and trading further intensify the rate of change taking place in eGIDs markets, its production systems, distribution channels, levels of innovation, and end-user activism. Change impacts on almost every segment of the global landscape.

Earlier end-of-pipeline strategies that were in control for over 80 years from the time of Taylor and Fayol, have ceased to hold relevance against the dynamic markets of the global economy.

“End-of-pipe” solutions that have now become irrelevant can indeed trace their origin to the early 1900, with the science of management starting from Taylor and Fayol. During the 80 years of its dominance of managerial and strategic thinking, concepts and theories and models have been developed. At best end-of-pipe solutions are transient in nature, respond partially to the needs of the market, and are generally limited in scope and reach.

End-of-pipe solutions therefore require an epistemic basis and a response that are aligned with the needs of the Emerging Global Industry Development sector or eGID. This is the basis of the PhD research – to study and develop new knowledge for the management with new approaches.

The industry press (with White papers, magazines, industry reports, announcements, strategic studies, and strategic announcements, etc) provide the best source of the trajectories and pathways for connection with eGID. Hence a significant requirement of the Literature Review process is to research and evaluate these reports.

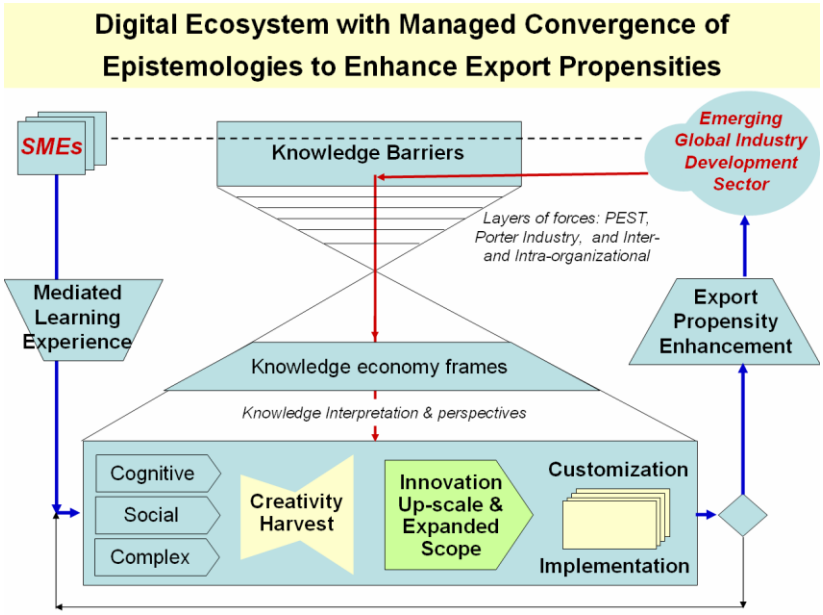

Figure 1.7 – The simplistic attempt at just using Post-2000 knowledge for eGID.

The epistemic "knowledge" engine (of Figure 1.7) is the embodiment of Joseph Schumpeter's Creative Destruction, combined with Paul Romer's New Growth Theory, and William Baumol's view of gazelles, and the new Born Global enterprises. .
One of the challenges of the Research Project is the fads and claims made by sections of researchers, industry, movements and special interest groups.

The appeal to embrace knowledge management (for example) in isolation of earlier knowledge and past experiences has been a counter – productive effort.

Figure 1.7 for example represents such a knowledge-only-limited model that attempts to offer SMEs a dedicated strategy-making pathway.

Unfortunately however, 15 years after Drucker first proposed the importance of knowledge workers the euphoria has subsided. The related reason for SME strategy-making is the complexities and the dynamic nature of the "knowledge" that is so acclaimed as the potential solution and which requires a special form of learning to leverage this knowledge.

1.6.4 Epistemic Building Blocks contributing to the Complexity

It is clear that the epistemic engine within the eGID must be a series of epistemic building blocks and that the innovations are the result of permutations and combinations of Pre-2000 and Post-

2000 activities, models, experiences and innovations. The building blocks are being adapted and integrated and re-presented with the support of other epistemic building blocks. The source of these epistemic building blocks is not just from the research institutes or the classrooms of Academia or from the industrial research labs of Industry. New disciplines of Knowledge Management and Innovation Management which first started to appear in the mid 1990s have grown to embrace new thoughts and ideas that have been traditionally not considered a part of business strategy-making. From an epistemic viewpoint it can be argued that these two disciplines must contribute to the complexities of the eGID.
In addition significant contributions made being made by the bio-technology sector that directly impacts on Post-2000 business. Epistemic contributions include new products that are supplied to the global market, or the integration of these products with other traditional products to make up hybrids. Also new tools and new thinking approaches are being reported upon that demonstrates the potential for epistemic and business lessons to be gained from this innovation-rich sector. The epistemic building blocks generated by this non-traditional business sector add further complexity in scale and depth to the eGID.

1.7 Problems with SME Strategy-Making

The case for research in SME strategy making therefore transcends several areas of economic, technological, academic, social and entrepreneurial domains.

What originally appeared to be a microcosm of MNC strategy-making (for re-use by SMEs) does not appear to be the solution.

1.7.1 Differences in sociological, technological and epistemological dimensions

The key research issues therefore appear to be the dynamic interactions between and across different sociological, technological, and epistemic dimensions – spanning not just a Post – 2000 era, but requiring combinations with Pre-2000 "exoskeletons" that contain inherent value.

1.7.2 Pre-2000 Models and Post-2000 Models

The context for the Research therefore involves issues of epistemic convergence of the knowledge, lessons, experiences and impacts from:

(i) Pre-2000 models and concepts

(ii) Post-2000 knowledge as reported in the industry, the media and academic research

(iii) The epistemic underpinning that shape and transform and invigorate the Macro-economic PESTE forces and then micro-economic industry drivers.

The key issue of epistemic convergence of all potential contributors to strategy-making will therefore require an epistemic – focused framework before any expectation on the benefits of managed convergence of epistemologies can be realised.

1.7.3 Epistemic convergence of PESTE Macro-economic Forces changing the business Environment

Attempts therefore need to be made with a focus on all eGID driving forces and factors from an epistemic – convergence viewpoint. Research by Steel and Konig 2007 confirm the validity of the convergence challenges. The PESTE forces for example can be better understood from an "epistemic convergence" perspective. The two-speed economy in the world can be examined from an epistemic convergence perspective, with Europe and parts of the USA and Japan growing at a rate of 1% to 3% in the Post-Global Financial Crisis and counties in emerging markets such as China and India at least 3 times that rate. Strategies required for the slowly growing markets are in marked contrast to the strategies required for the emerging markets as illustrated below:

Strategy-making implications for Low-speed economies of the world (Europe and parts of USA and Japan)	***Strategy-making implications for High-speed markets of the world – the emerging markets of Asia and Russia and Brazil***
National Growth rate is 2% - 4%	National Growth rate is above 8% to 9%
Industry Growth rate less than 5%	Growth rate exceeds 40% in several sectors
Strategy focus is on efficiency improvement because of growth limitations	Strategy focus is on "Relative Growth" that must at least match or exceed the industry sector's growth rate.
Strategic threat in failing to match low growth rate – loss in profitability	Strategic threat is loss of profitability as well as "Loss of Market Share"
Levels of investment are low – with the strategic focus on profitability	Investment levels need to be high to grow with the market demand
Product strategies and outlook can focus on extending the product life with marginal changes	Significant product changes to meet strategies of satisfying local cultural preferences and business conditions. Product designs will need to be created in the local market locations to capture the nuances and key determinants for success
Strategic business environment is relatively stable – with changes occurring more at the ownership levels with Mergers and Acquisitions	Strategic business environment is dynamic with government de-regulations on the range of free-market business activities, transactional limits, ownership, foreign investment, and sectors reserved for national interests. Strategies and decision-making have to be made on the basis of the dynamics and volatility of the local business environment, rather than assuming a static or fixed set of

	business rules
Headquarters and centralized Research & Development institutes are shrinking in size	More Multi-nationals are moving their headquarters to the emerging markets that are creating and generating greater contributions to the corporate balance sheet.
Strategies for product development are now being re-shaped to adopt a global context, with increased provisions for sharing the knowledge directly with the branches in the emerging markets.	Product Development Strategies are moving beyond the imitation phase, and moving into the development of their own products and technologies in collaboration with the established markets
Strategic investment is largely directed at facilitating outsourcing and the reduction of manufacturing activities in the established markets	Investment strategies focus on both building the local market-base as well as stretching into the established markets. Joint ventures and acquisitions are the most commonly used strategy to obtain and adapt and enhance the original technologies of the established markets
Decision making and strategy development no longer focuses totally on established markets	Strategy is focused on a networked world, with a focus on time-based competition, and

The epistemic – convergence challenge is to map the degree to which Post-2000 knowledge is de-constructing and selectively re-using portions of Pre-2000 knowledge and then commercializing the aggregates and composites, as new Post-2000 innovations.

1.7.4 Departure from conventional approach

Epistemic volume increase is not the solution for SME. Epistemic issues and the infrastructure for knowledge/ epistemic convergence are additionally required to adapt and utilize the new issues does not exist sufficiently for the SME to take advantage and develop the necessary strategy-making capacity.

1.8 The phenomena of global complexity - The Post-2000 business landscape

In this section we continue the elusive search for strategy-making models that could benefit from managed convergence of epistemologies.

In figure 1.8 and Figure 1.9, we present the economic situations that have resulted in the Pre-2000 and Post-2000 era.

1.8.1 The Historic perspective and the Challenge of the Post-2000 Knowledge Economy

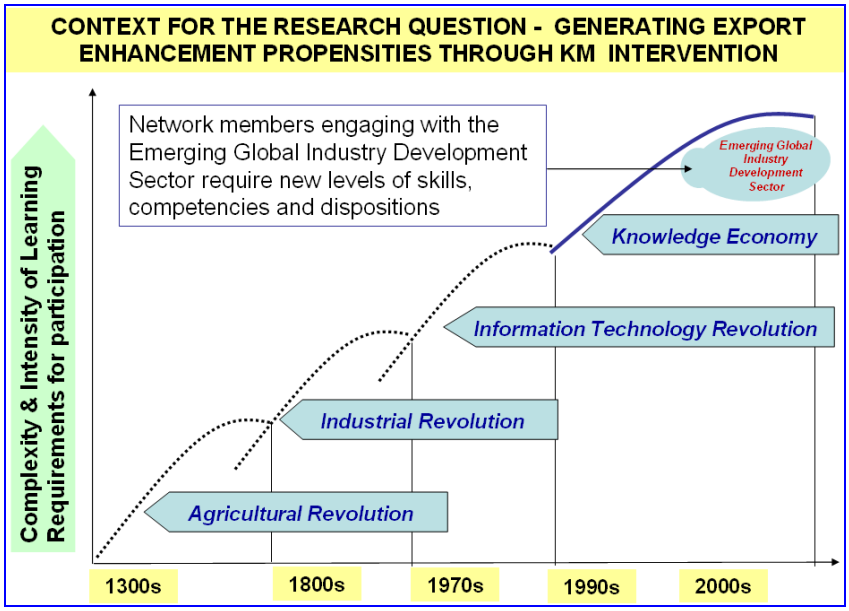

Figure 1.8 – A historic perspective of the power of epistemic convergence.

Normann has provided a historic perspective of the issues and concerns that have characterized different stages of human development and business advancement.

Starting with the agricultural development, human society has adopted successively advanced paradigms to assist with the organization of labour and resources. Drucker was the first to further characterize this historic perspective – by identifying the knowledge economy, and the need for new perspectives in strategy-making.

According to this historic perspective, SMEs are currently in an advanced stage of social and technological development – demanding cognitive skills and innovative technologies that characterize the Post-2000 Knowledge economy. What is clear from the historic perspective is that one cannot reject the past – one must blend and adapt and meld the important issues of the past but in the context to satisfy the current needs of the present and the immediate future.

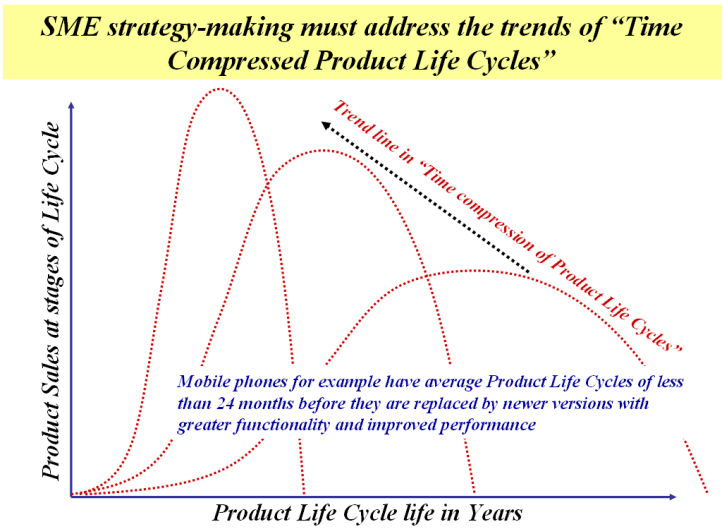

Figure 1.9 – Post-2000 compaction of Project life cycle

Recognizing this perspective, it is clear that SME strategy making is more demanding of resources, innovative thinking and higher order cognition. Mere reliance on the thinking of the past is to guarantee disqualification of SME success.

Figure 1.9 for example presents the ever-compacting time-scale/ duration of the Project Life Cycle of innovation in the Post-200 era.

The key to its understanding appears to be the increased competence of OEM/ developers/ marketers such as Apple, Nokia, Samsung, etc. They are adopting a strategy which reflects their new skills to manage the convergence of epistemologies across multiple domains with both Pre-2000 and Post-2000 artefacts. Giles 2007 provides a realistic "techno-business" description of the new opportunities and challenges that cannot be neglected in SME strategy making.

1.8.2 Inflexion Point Management

It is clear that a new business landscape has emerged and it has been termed by many as the knowledge economy. The term is grounded on the research and findings of management scholars such as Drucker, Eisenhardt, Doz, Hamel, Prahalad, Normann, Romer, Christensen, Zook, and others. In this knowledge-landscape, the barriers that need to be managed are complex. They result from a dynamic interplay of the traditional macro-economic forces with a range of emerging epistemic forces. The macro-economic forces (termed PESTE forces) recognize the influence of Politics, Inflexion Point Management - Economics, Social/legal, Technological and Environmental factors that influence business.

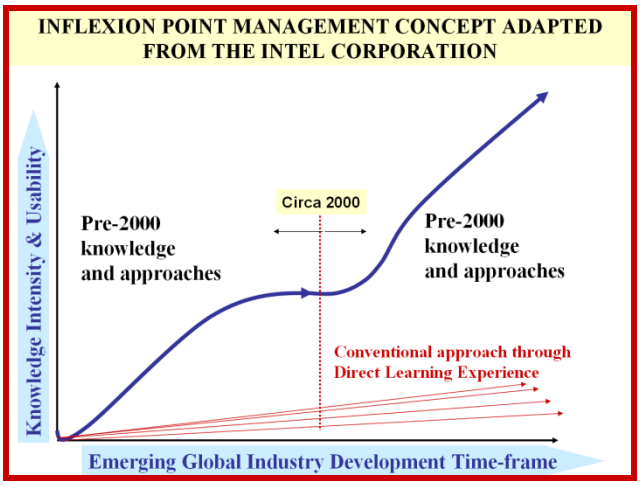

Figure 1.10 – Evidence on the managed convergence of epistemologies.

In Figure 1.10 also illustrates the accelerated pace of change that coincided with the turn of the twentieth century and the start of the new millennium.

1.8.3 Innovations driven by knowledge & collective effort

The "Inflexion Point" concept is becoming increasingly evident in almost all sectors of the Post-2000/

The Global Financial Crisis of 2008 for example is significantly contributing to "Inflexion Point" type changes to the management and re-growth of global investment.

It is also clear that the renaissance of new financial markets will take place under new PESTE environments and that they key challenge will be the managed convergence of the portfolio of epistemologies relating to new product development, regulatory control, corporate governance and transparency and visibility in relation to risk, return, and reporting.

1.8.4 Knowledge Gap – MNC contributions Vs SME capacity

Knowledge available to the global economy has been increasing at a doubling rate of less than 2 years in nanotechnology and some IT sectors. This is judged by the aggregation of increasing number of research articles, patents, work-force numbers, research funding, new ventures, rates of educational graduates, etc. A large portion of this increased knowledge is the direct result of the actions and investments made by Multi-National Corporations (MNCs). Pfeffer and Sutton 1999 have estimated that $60 Billion was being invested each year in the 1990's on training and management development programs alone. In the Post-2000 era, this estimate could well approach the $100 Billion mark. No data exists on the relative amount that SMEs invest in their training and their contributions to new knowledge in the global economy.

It is argued that SME awareness of the issues underpinning the dynamics and changes in the global economy would be comparatively low. Non-SME investments in new knowledge and

training (especially in some of the more sophisticated CRM, ERP, SAP, and Business Intelligence programs) would only amount to a fraction of the $60-100 Billion that MNCs expend in their training and management development. Hence a structural barrier will continue to exist as long as this investment differential is maintained.

1.8.4.1 The Challenge of using the MNC knowledge in SME

The key issue is that the substantial MNC management development and training have directly or indirectly produced several of the strategy-making tools and business models that can assist SMEs. A wealth of information on the work of Business Consultants has been disclosed within business books, research articles, academic text books, and curriculum. Recently there has been a trend in retiring and serving MNC CEOs, who have authored books detailing their experiences in introducing new concepts such as Open Innovation, the 7S model (McKinseys), etc. The implications and challenges presented by their contributions is the degree to which SMEs can adapt and utilize this knowledge-base.

1.8.4.2 Government expectations

European Community Lisbon Treaty stresses the importance of knowledge and the creation of networks and ecosystems as the bridge for the creation, development and diffusion of knowledge. Underlying their expectations are a commitment to the managed convergence of all related epistemologies.

1.8.4.3 The phenomena of global complexity& Issues

A further perspective on the need for the managed convergence of epistemologies for SME-strategy-making is embedded within the concept of "Globality".

As well experienced management consultants with the same "BCG" company that created the "BCG matrix for business strategy – making", and as a team Sirkin, Hemerling and Battacharya (2008) have argued for a change in the strategy-making mind-sets. For them it is mandatory for new skills to be developed to achieve the managed convergence of epistemologies in the Post-2000 era.

They explain that with a managed convergence of approach "global challenger companies—that grew up in the rapidly-developing economies—are challenging the big, developed-country corporations that have been globalization leaders for the last two decades. Both challengers and incumbents will find themselves competing with everyone (including former partners and suppliers) from everywhere (in both developed and developing markets) for everything (including customers, talent, and more)".

The effectiveness of epistemic convergence is demonstrated by the examples provided by Sirkin et al, which includes:

- eGID —such as Bharat Forge and Tata of India, Goodbaby and Baosteel of China, Cemex of Mexico, and Embraer of Brazil.
- Incumbent companies from the United States, Europe, and Japan—including Nokia and Emerson—that have transformed themselves for eGID participation by adapting the practices of the challengers to their own businesses.
- New ideas about convergence management and organization for collaboration and the emerging era of hypercompetition.

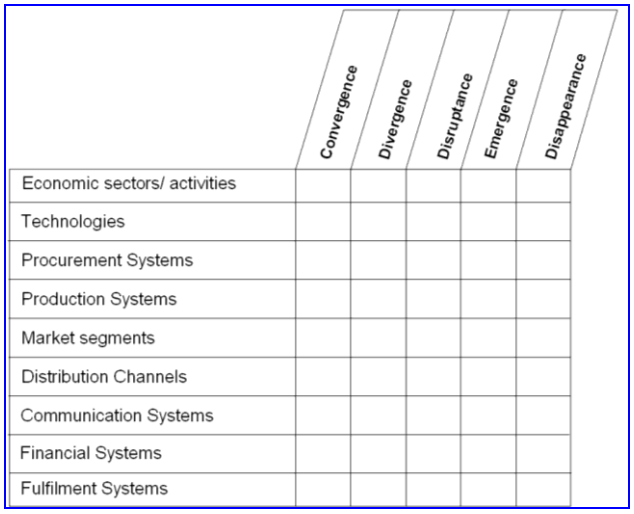

Figure 1.11 – A grid approach to managing convergence for eGID.

Epistemic convergence problem – Government and local community expectations and support takes on new meaning with the managed convergence of epistemologies.
SMEs and individual experts are recognized as the initiators of innovation – whether it be in the garage or while gaining insights on the factory floor of the employer

The concept of the managed convergence of epistemologies needs to observe and explain the issues of complexity, speed, velocity, successive and relentless innovations, global advances, intense competition, boundary-less and border-less intrusions and participation from the entire globe, re-framing and re-presentation of products, digitization of all inputs and outputs, cyber connectivity, real-time instantaneous responses and counter-responses, product innovations with multiple functionality, single technology for multiple products

Peter Drucker the undisputed thought leader in business management has termed the 2000-business era, the era of Knowledge management, as the successor to the Information Management phase

Richard Normann has traced the history of civilizations as a succession from the Agricultural economy, through to the Industrial Revolution, to modern 20 Century steel and plastics age, to the Information economy, and the Cyberspace economy.

Kenichi Ohmae's characterizes the future as the "The Next Global Stage" – where small and large entities can perform and succeed. Is this the answer for SMEs. The common underlying theme in all of their pronouncements is the need to manage the converged epistemologies, from

every cross discipline and multi-discipline source. Figure 1.11 provides the grid-management type approach necessary for this convergence.

1.8.4.4 Epistemic Problem - Knowledge Gap

The epistemic challenges being faced by SME strategy-making can be further explained by the concept of the Epistemic or knowledge gap.

The concept of the managed convergence of epistemologies taking place in eGID directly leads to the annunciation of the concept of the "Global knowledge-base curve", as illustrated in Figure 1.12.

The aggregation of epistemic outputs confirms the eplosive nature of knowledge growth and the rising growth rate of the Global knowledge curve.

Figure 1.12 – The dynamics of the knowledge gap.

Figure 1.12 illustrates the problem faced by SMEs wishing to successfully develop strategies for participation in the global economy. The top curve represents the demand for level of knowledge that needs to be represented within strategies required for success in the global economy. The supply situation or SME capabilities in satisfying the demand curve is represented in the lower section of the diagram. The knowledge-gap between the supply and demand situation is also represented as an increasing area, which we term as the "Knowledge Gap". The dynamics of the knowledge-gap is created by the dynamics of the global economy and the limitations imposed on the SME in supplying the required knowledge.

The dynamics of the global economy is fuelled by the continued growth of knowledge and participation levels of innovators and entrepreneurs from around the world. Equally strong and impactive are the epistemic inputs from multi-national corporations (MNCs). Prior to their inputs and facilitation of globalization, these corporate entities have been responsible for more

than 100 years of business strategy studies starting from the days of FW Taylor, nearly 100 years ago.

Managing the Knowledge gap requires managing the Supply-Demand Gap and the Innovation-eGID participation gap.

Economist Survey of 1656 very senior executives from 100 countries Foresight 2020 vision/ survey conducted in late 2005 confirming the increasing efficiency of the knowledge workers.

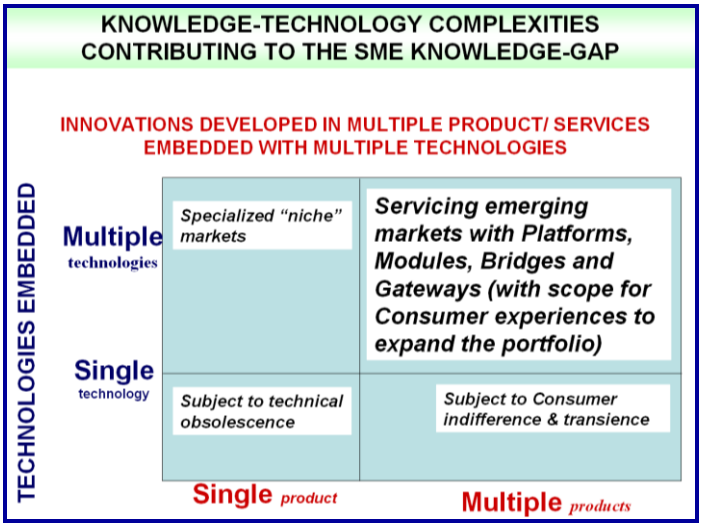

Figure 1.13 – Technology's contribution to epistemic convergence.

Figure 1.13 confirms the nature of the contributions made by technology to the disruption and the complexities confronting SMEs and the creation and growth of the Knowledge Gap Challenge (KGC) being faced.

The active and dynamic role of managed convergence of epistemologies from multiple domains can be the only explanation from the wealth of Post-2000 era innovations.

1.9 Need to support SMEs with Knowledge Management

The Economic need to support the development of SME strategy-making is therefore transformed into one of assisting SMEs better achieve capabilities in the managed convergence of epistemologies from multiple domains that span the full spectrum of Pre-2000 and Post-2000 concepts and models.

1.9.1 SME strategy making Dilemma Issues

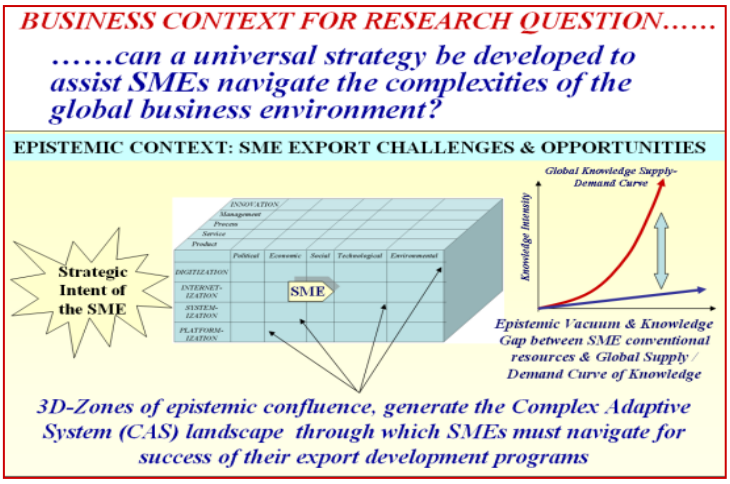

Figure 1.14 – Managing the Value Chain in the context of the knowledge gap.

Figure 1.14 presents the challenge for SMEs attempting to manage their Value Chain within the epistemic environment of the Global Knowledge gap.

Direct supply of additional information will not help solve the dilemma, just volume addition or training to address specific issues that are apparent in the eGID will not be the answer. The dynamics and pace of the change taking place in the eGID will render irrelevant or obsolescent any project or program specific training or resourcing. Research presented by Mathews 2006 confirms that many variables and interacting factors are rapidly changing the dynamics and the pace of change for Pre-2000 strategy-making approaches to be of relevance.

The Direct Learning Experience of conventional teaching and learning cannot be applied therefore unless it focuses on the managed convergence of epistemologies. Psychologists assisting in the education and development of children who have been subject to trauma and the horrors of war have proved that the process of cognitive development needs a different approach to a relative supply-side approach with a Mediated Learning Experience can be successful.

1.9.2 Combination Challenge - The Intel Inflexion Point– the Digital Business Ecosystem perspective

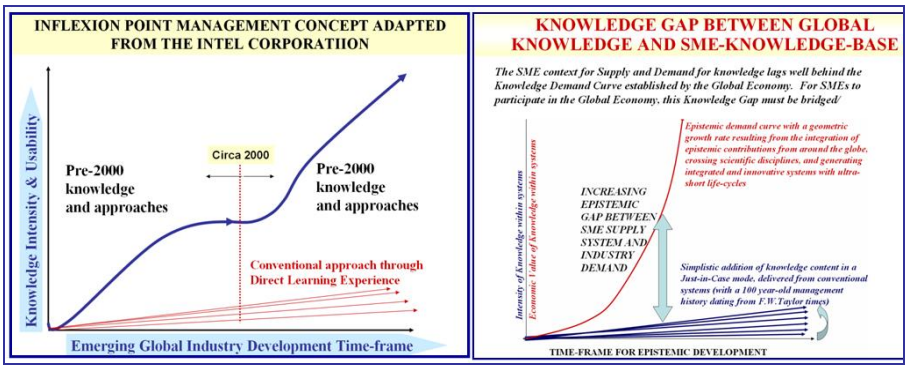

Figure 1.15 – The need for Business

In metaphorical terms, SMEs are effectively confronted by the "perfect storm". As illustrated in Figure 1.15, the "Inflexion Point" on the left has significant connotations for SMEs. Continuation with some of their past approaches to strategy making may be meaningless. By contrast the impact of other strategic approaches that should not have been neglected by the SME could disastrous. The Inflexion Point underscores the need to nurture and support the right strategic resources. However what these actual resources need to be is not determinable – its value is only known after the fact. Its further impact is also illustrated – in this case on the right side of the diagram. Here a dynamic link needs to be maintained between the demand for embedded knowledge (from the target buyers) and the supply of the embedded knowledge (from the SME supplier). This Knowledge gap is expanding and the dynamics of the ever increasing difference between demand and supply is exacerbated by the emergence of the Inflexion Point conditions generated by advances in technology, customer demands, economic factors, and supply and delivery infrastructure and information and communication systems. The search for SME strategy-making knowledge must therefore also include the search for the factors causing the dynamics of change and knowledge-gap increments.

1.10 Research Questions

Based on the preliminary exposure to the issues confronting SME strategy-making, we argue that the PhD project must define the problems and integrate them into a Research Question whose sub-components seek answers to the following:

(i) How we are going to manage the Knowledge gap
(ii) How we are going to transform the SME strategy-making thinking from industrial age managerial approaches to the Knowledge Economy era of strategy making
(iii) What epistemic exemplar or catalyst can assist in the management of the knowledge gap and the Knowledge economy transference
(iv) How the epistemic exemplar would need to be linked to SME strategy making
(v) How we can test the epistemic validity of the exemplar in SME strategy making

1.10.1 Research questions on the SME dilemma

Clearly the managed convergence concept must address the challenge on how to manage the Knowledge gap which requires managing the Supply-Demand Gap and the Innovation-eGID participation gap.

Figure 1.16 – A meta-strategy for managed convergence

In Figure 1.16 we illustrate the epistemic convergence dilemma and the epistemic temptation to resort to short-cut solutions. The simplistic approach is to suggest that a type of "work-around" may be the way to a solution, an approach used by some in the IT industry. In this context it is also fair to ask whether the Research Question can be adequately addressed by a version of "strategic innovation". Equally valid is the option to query whether it is a universally applicable "business model" that is eluding the enhancement and propensity for SME participation in the eGID sector. The sub-questions of whether the emphasis should be placed on marketing, or supply chains, or ecosystems are part of the dilemma confronting SME strategy making for participation in the eGID sctor.

1.10.2 Does a meta strategy exist

Does a meta strategy exist that can assist SMEs develop strategies and resolve the application of the concepts of epistemic convergence ?

1. Can the average SME make sense of what is happening here?
2. Does the average SME have the capacity and resources to access all of the information of relevance to understanding these patterns and the phenomena that seems to be responsible for the strategy making dilemma?
3. Are we focusing on the symptoms of an underlying problem?
4. What is at the core that is the cause of the changes and accelerations and velocities of innovations taking place as part of the global developments?
5. Is there a core area that needs to be addressed for strategy making?

- Is it necessary that the Direct Learning Experience of conventional education and training be replaced by a Mediated learning Experience?

6. Should SMEs align themselves with the IT sector, the cyber-network economy, and or the knowledge economy?

7. Is there specific issues within Academic training and academic qualifications that can help develop the cure with the required strategy making capacity?
8. Will the study of Complexity and of Complex Adaptive Systems deliver the required answers for required strategy making?
9. Can industry offer the miracle cure?
10. Does the Knowledge management discipline contain the cure, among its portfolio of new thinking and concepts?
11. Is the Innovation management discipline better suited to address the innovation issues required for participation in the global economy through good strategy making capacity development?

1.11 Scope of Thesis

The Research Project seeks to first identify, characterise and evaluate the context in which SME – strategy making needs to take place for successful innovation – led business in the Global economy.

For this purpose, the concept of the Macro-economic forces, the micro-industry forces and the epistemic forces that impact on SME strategy-making are evaluated. In this context, the Research Project has made a determination on the need for the concept of the managed convergence of epistemologies if there forces are to managed and their "Global Knowledge Gap" challenges are to be overcome. The dynamic nature of the strategy-making domain is confirmed by Daniell (2006).

Evaluating the scope and potential to use the managed convergence requires the detailed examination of the Pre-2000 and Post-2000 building blocks that are required for strategy making. Further it requires strategies that separate the expert from the expertise, the technology from the value-delivery system, and knowledge from its embedded and multiple representations (Levy 2005)..

The Research Project similarly makes an intermediate determination that the epistemic merging of Pre-2000 and Post-2000 building blocks may not be easily realised.

The SME barriers preventing the aggregation of knowledge justifies the Research Projects search into other scientific disciplines.

The scope therefore expands into the science of Post-2000 systems Biology – in search for the epistemic exemplar, to become the catalyst for SME strategy making to break-out of the limitations of the business studies involving Pre-2000 and Post-2000 "business discipline" approaches.

It is in this context that the scope covers the potential for the DNA-genomic system to function as an exemplar that can be emulated for knowledge aggregation mechanisms. A bio-mimicry – based model was conceived and tested as part of the scope. In the process the further potential for DNA's knowledge and wisdom management potential has been identified.

Its specific segment covering DNA- in the neurobiology of cognition, analysis, communication, and collaboration has offered a "Bio-inspired" paradigm shift for knowledge aggregation in strategy-making.

Finally the Project presents the Bio – inspiration model and its neurobiological foundation in the context of the most exciting scientific discoveries taking place in systems Biology and the Biology of the Mind.

Finally the scope leads to the conclusion that SME's can indeed use the neurobiological perspective to better understand and manage their successful participating in the Global eGID landscape with a new portfolio of innovative meta-thinking resources. It is in this context that Appendix 1 has been developed to provide SMES with a practical guide to be able to use the Model developed in this Thesis.

1.12 Plan of the Thesis

Chapter Title	*Content of the Chapter*
Chapter 1- Introduction	(i) The concept is created of the emerging Global Industry Development (eGID) sector of the global economy, which is characterized by complexity and barriers to SME participation (ii) Barriers confronting successful SME participation in eGID are conceptualized as a Knowledge Gap that needs to be managed; (iii) Sources of knowledge that need to be mobilized to manage the Knowledge gap are categorized into Academia, Industry, Knowledge Management and Innovation management (ΣΑΙΚΙ); (iv) The concept of SME Export Propensity Enhancement (EPE) is created as the indicative mechanism that would result if the management of the eGID Knowledge gap is successful .
Chapter 2- Literature Review	A systematic review of the available resources for the type of strategy – making building blocks required by SMEs. Representative building blocks are presented from Academia, Technology in Industry, and the Knowledge Management and Innovation Management domains. They confirm the voluminous nature of related knowledge and strategic insights that need to be created for SME strategy-making
Chapter 3 – Problem Definition on Epistemic Barriers faced by SMEs for strategy making	(i) Barriers on the Supply-side of the epistemic issues (ii) Barriers on the Demand-side of the epistemic gap (iii) The "Knowledge Gap dynamic" (iv) Dissonance in resources available to SME (their original target being MNCs) (v) Establishing the basis for the 4 Research Questions, viz. on

	over-riding structural barriers, building a Model, establishing its implementation pathway, and applying the Engineering-Scientific methodology for testing
Chapter 4 - Questions	The Research Questions are developed based on the barriers and complexities presented by the eGID sector which confront successful SME strategy-making. The framework of a conceptual solution is offered. It is grounded on epistemic factors that need to be addressed at the atomic level. The case for a departure from the Pre-2000 approaches of offering "end-of-pipe" solutions is argued. A new staged and progressive learning approach incorporating an epistemic metaphor with Blooms Taxonomy is offered for more detailed study and consideration in Post-2000 SME strategy-making
Chapter 5-Blooms	Examples are presented of the type of content sourced from Academia and related research. They represent the content from which SME strategy-making would need to emerge using the conceptual learning solution's approaches that are grounded in Blooms Taxonomy.
Chapter 6 Bloom Technology	This Chapter repeats the elaboration of the Bloom Taxonomy's requirements in the context of utilizing the type of content and resources offered by Industry-generated research. The staged epistemic requirements of Awareness, Comprehension, Application, Analysis, Synthesis and Evaluation are presented in the backdrop of the future use of the epistemic metaphor embedded within the Conceptual Solution proposed.
Chapter 7 Bloom Knowledge	The Chapter presents a further set of requirements associated with the conceptual solution – in this case the type and use of strategy-making building blocks offered by the Knowledge Management sector. The concepts straddle the Pre- and Post-2000 era of strategy-making and the conceptual framework offered by the Blooms Taxonomy further illustrates the need for an epistemic metaphor for SME utilization.
Chapter 8 Problems Blooom, strategies	This Chapter presents the final and fourth domain of strategy-making content that elaborates on the requirements of the concept solution. The focus is on the Innovation Management Movement and sector. This domain characterizes the Post-2000 era and the realities that need to be addressed with relevant strategy-making. While the examples presented are complex and trans-disciplined in nature its is argued the Blooms Taxonomy does offer a structured approach to simplify the challenges and requirements for SME participation in eGID.
Chapter 9 – Convergence Conceptual approach to problem resolution for Strategy Making	The Chapter establishes the preparatory work to test the value of the gaining lessons from the Bio-epistemic Exemplar that exists in the form of the biological DNA molecule. The problem evaluation systems are set up with Bloom's Taxonomy of Learning so that it can be applied to the 4 domains of strategy-making building blocks – that have been addressed in Chapters

	5,6, 7 and 8. The aim is to determine if SME relevant eGID strategies can be transformed and re-developed despite their original focus on MNC strategic-business contexts.
Chapter 10 – Bio Inspiration Subjecting the Unit of Analysis to required Learning with the Academia-generated building-blocks and their potential for leverage with the epistemic exemplar	The MNC-contextualized strategy-making building blocks are subjected to the Bloom Taxonomy. The Chapter aims to determine if SMEs can adapt the MNC-focused resources for SME relevant usage, with the assistance of the Epistemic Exemplar. The Chapter concludes that the conventional MNC resources from Academia lack the meta-level of knowledge for the required SME transformation
Chapter 11 – Bio-Paradigm Subjecting the Unit of Analysis to required Learning with the Technology-generated building-blocks and their potential for leverage with the epistemic exemplar	The MNC-contextualized strategy-making building blocks from Technology in industry are subjected to the Bloom Taxonomy. The Chapter aims to determine if SMEs can adapt the MNC-focused resources for SME relevant usage, with the assistance of the Epistemic Exemplar. The Chapter concludes that the conventional MNC resources from Technology in industry lack the meta-level of knowledge for the required SME transformation
Chapter 12 – Conceptual Testing Subjecting the Unit of Analysis to required Learning with the Knowledge Management-generated building-blocks and their potential for leverage with the epistemic exemplar	The MNC-contextualized strategy-making building blocks from the Knowledge Management domain are subjected to the Bloom Taxonomy. The Chapter aims to determine if SMEs can adapt the MNC-focused resources for SME relevant usage, with the assistance of the Epistemic Exemplar. The Chapter concludes that the conventional MNC resources from Knowledge Management lack the meta-level of knowledge for the required SME transformation
Chapter 13 – Perceptual Testing Subjecting the Unit of Analysis to required Learning with the Innovation Management-generated building-blocks and their potential for leverage with the epistemic exemplar	The MNC-contextualized strategy-making building blocks from the Innovation Management domain are subjected to the Bloom Taxonomy. The Chapter aims to determine if SMEs can adapt the MNC-focused resources for SME relevant usage, with the assistance of the Epistemic Exemplar. The Chapter concludes that the conventional MNC resources from Innovation Management lack the meta-level of knowledge for the required SME transformation
Chapter 14 Practical Testing –Leveraging the potential of the Epistemic Exemplar with DNA-Bio-inspiration to overcome the Learning and Pathway barriers	The Chapter introduces in greater depth the epistemic value of the DNA as the Information-Molecule upon which Nature's Knowledge System is grounded. Problems identified in Chapters 5-8 can be over-ridden with the DNA's mechanisms of convergence management and epistemic transformation. The Chapter provides the basis for the elements of the Epistemic Exemplar to be integrated into a Bio-inspired strategy-making

	Model
Chapter 15 – Case studies The Bio-inspired Business Strategy-making Model is developed with epistemic parallels with Nature's knowledge building and knowledge convergence/transformation mechanisms	The Chapter's Bio-inspired Model offers a framework to assist the SME mindset to draw epistemic parallels during the full project life-cycle of strategy-making in business. An Epistemic Engine is presented which utilizes epistemic parallels for converging, transforming, adapting, generating, and enhancing Pre-2000 and Post-2000 building blocks into innovations with creative destruction. Developmental and Transactional phases are considered and integrated with the scaffolds of Academia to maximize the benefits from the Exemplar. The Model like the Brain does not seek to create new neurons, but simply to establish greater synaptic connections and neuronal circuits between the existing neurons.
Chapter 16 Recaptulation	This Chapter makes a final presentation of the Bio-inspirational exemplar for the future of successful SME-strategy-making in the Post-2000 era of eGID. The Chapter outlines how the lessons from the DNA-based exemplar can benefit from the business examples re-presented as summaries of the project's research findings. The Chapter argues for the generation and re-framing of the epistemic responses with the DNA-exemplar effectively utilizes the lessons and the manner in which the Mind guides and controls the workings of the Brain and the rest of the human life-form. The structure of the DNA molecule with its Protein-coding Genes (making up 1.8% of the DNA molecule) and its non-protein epigenetic segments (98% of the DNA molecule) offer a bio-epistemic metaphor and an epistemic exemplar that directly relates to all of the Pre-2000 and all of the future Post-2000 strategic issues that can ever develop. The Chapter also seeks to demonstrate how the use of the Bio-epistemic catalysts can re-vitalize and re-create innovation even with the Pre-2000 business models. This is the bio-epistemic mechanism used by the Mind to strategically create the innovative thinking that is then executed by the Brain and the rest of the human life-form. This is the renaissance that not only presents new issues for the Post-2000 era but it adds value to the 100 years of research from the Pre-2000 era. The Chapter finally suggests that the DNA-based Mind-Brain metaphor could become the basis for a new paradigm shift in learning for SME-strategy-making. The Chapter confirms the need for further trans-disciplined research in this exciting approach and framework that is grounded on the relatively un-explored domain of the Information System that is embedded within the Human DNA molecule.
Appendix 1	A practical guide for use of the Model by SMEs

1.13 Conclusion

SMEs are confronted with a epistemic phenomena that needs to be better understood by going back to the sources of knowledge and information that appear to contribute to the phenomena, vic: Academia, Industry, Knowledge Management Discipline, and the Innovation Management Discipline and the requirement for the managed convergence of their epistemologies.

The SME strategy making dilemma revolves around the key issue that SMEs have a restricted resource base to access the information and knowledge required for strategy making. Simultaneously SMEs have been recorded as possessing a low demand to self generate some of the skills and pathways necessary to capture the required resources, beyond the demands to which they are already subject.

The interacting impact of the accelerating demand for knowledge, with the reduced propensity to self-generate the required epistemic response, are together creating an increasingly the knowledge gap. This is in turn is reducing the capacity for SMEs to participate in the eGID landscape. The need for a SME relevant strategy making capacity can therefore be visualized as the methodology required to stem the increasing knowledge gap. Uncontrolled, the increasing knowledge gap hass the potential to almost shut down all SME venturing into eGID, depriving local communities and local Government of the great potential by SMEs to deliver prosperity. To investigate the required strategy making capacity we however need to visit all of the potential sources from which the emerging factors arise. The disciplines of academia, industry, knowledge management and innovation management have been selected for a review of their potential for SME relevant strategy making.

In the chapter that follows, we review the strategy – making building blocks. The focus is to be able to determine the scope for managing the converged epistemologies embedded within the building blocks and related disciplines.

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CHAPTER 2 – LITERATURE REVIEW

"If I have seen a little further it is by standing on the shoulders of Giants." – Sir Isaac Newton, 1676

2.0 Introduction

The Chapter reviews existing business models and operations and those claimed world-class strategies both for SME and MNC (Multi-National Corporate) strategy-making. The Chapter reviews these methodologies in order to gain an appreciation of strategy-making capabilities and the challenges that must be addressed by SMEs if they are to succeed in creating emerging-industry relevant innovations and participate successfully in eGID (emerging Global Industry Development). The review and analysis of the existing world-class strategy-making is very necessary because it provides a visualization of the epistemic challenges that are involved with any SME strategy-making from plan to adapt, or blend, or amend or customize into their SME context. The literature review focuses on the perspectives of epistemic building blocks and the driving forces and resources that would appear necessary for SMEs to become innovative and develop new strategies for participating in the emerging Global Industry Development (eGID). The literature review also focuses on Strategy-making and strategy-related processes are responsible for business innovation and handling the dynamic changes in the global economy.

The literature review in this Chapter is segmented into 4 areas from the perspectives of strategy-making building blocks for SMEs and their approaches for creating new business opportunities and innovations for participation in the emerging Global Industry Development (termed eGID for the Research Project).

The 4 segments are:

(i) Theoretical-oriented Business Strategies – which involve 100 years of academic learning and research on strategy-making in generic terms

(ii) Technology-enabled Business Strategies, which have been found by eminent economists such as Richard Solow and Professor Paul Romer (2001), to account for approximately 80% of GDP growth in the USA

(iii) Knowledge-based Business Strategies – which focus on the Post-2000 Knowledge management Movement, initially suggested by "thought leaders" such as Drucker and Professor Nonaka (1991, 2000) , Ohmae (1995), Fei Gao, Meng Li, Yoshiteru Nakamori, (2002), and

(iv) Innovation-driven Business Strategies – in which the focus is directly on innovation creation and the aggregation of knowledge and legacy-based strategies for the Post-2000 emerging global industry development sectors.

At the end of this chapter, we give critical evaluation of the approaches in each of the above segments, as well as provide an overall critical summary of all the approaches in different segments.

2.1 Definitions of Terms and Concepts used in this Chapter

eGID – the Post-2000 era of global business, and that segment within where the focus is on emerging industries and the creation of new business opportunities for SMEs, via the pathway of created innovations.

Pre-2000 Strategy-making Building blocks – are the accumulation of 100 years of strategy-making studies that include research findings, business models, perspectives, approaches and conceptual constructs – all focused on assisting businesses manage the challenges of competition, profitability and sustainability

Post-2000 Strategy-making Building blocks – are the analytical perspectives on the driving concepts and business models that are achieving success in the emerging global industry sector. Largely reported in the mainstream industry press and media, these Post-2000 strategies are linked with the success storeies and reports on organizations such as Google, Apple, and Salesforce.com and others who have introduced new approaches that are in contrast to the legacy-based approaches of the Pre-2000 methods.

Strategy-making – the process by which SMEs can visualize the pathways in which they can advance their businesses, with increased growth a, profitability and sustainability

2.2 Review of Pre-2000 and Post-2000 Strategy-Making

Over the past 100 years "thought leaders" such as F.W. Taylor and Professors Michael Porter, Ohmae, Drucker, Eisenhardt, Ghoshal, Prahalad, Hamel, Christiensen, Mintzberg, Nohria and others. Prusak and Davenport (2003) have presented both a chronology of their research efforts as well as a grading of the innovative thinking for which they have been recognized academia and industry. As an academic and industry-bsed Management Consultant Ohmae (1995) has developed and offered strategy formation approaches that involve individual cognition and social interaction and global relevance. They have argued for cooperation as well as competition. They have presented "Business Models" as a result of their strategy-making perspectives. Simultaneously the Business Models have in turn crated their own portfolio of required strategy-making approaches.

Several bodies of literature have already focused on the epistemic resources available to SMEs for strategy making, as summarized by Mintzberg, Ahlstrand, and Lampel (1998) in their book "Strategy Safari: A Guided Tour Through the Wilds of Strategic Management". Professor Mintzberg is acknowledged as one of the foremost thinkers in business strategy and their book itself is based on a review of 2000 strategy management articles published since the 1960s. In the opinion of Mintzberg et al., strategy making is complex, dynamic, and mandatory in the borderless global economy. Additions to existing knowledge and approaches need to be constantly created, modified, and adapted to match the emerging needs of the global economy. Hence any SME-relevant strategy-making research cannot ignore the source from which the new emergent strategies need to be derived. It is in this context that the Literature Review conducted in this Chapter actively seeks to identify the scope and potential for key strategy-making

concepts to be made available for SME strategy making and the resolution of the Research Question.

The issues of technological convergence and divergence in their own right appear to be responsible for the proliferation in new consumer products, new manufacturing processes, new business systems, etc. However, it can be argued that the technology's potential is magnified when it is combined with the 3 other domains or sources for strategy-making. In combination innovations abound in scale and scope, embedded within products alongside other innovations, as outlined in the 4 sectors for stregy-making. For example, the Post-2000 "smart" phone is but one example of the multiple innovations embedded within a single product that combines technologies with the 3 other domains. The trend is not isolated. It extends to all electronic goods, entertainment goods, traditional white goods and automotive products, etc. Indeed it would be difficult to identify mass produced products (apart from food and drink) that did not include the ubiquitous and embedded collection of software, micro-computer systems, printed circuits, and special sensing systems – that are Post-2000 versions of the older legacy systems and their Pre-2000 building blocks of strategy-making..

The commercial success of the Nintendo Wii Entertainment System and other consumer electronic systems (Hey 2010 on "The Next Scientific Revolution") deliver further examples of the new functionality and the new "innovation landscape" and usage domain that combines Pre-2000 concepts with Post-2000 development in the use of embedded software that is enhanced with the digital inputs. These inputs include signals and controlling actions from motion sensing devices and accelerometer calculations and infra-red enabled connectivity between player, screen and the computer-controlled device.

It is the aggregation of such Pre-2000 and Post-2000 strategy-making conceptualizations that are generating the innovative products and services that characterize the same global economy. It is the interconnection of the Pre-2000 and the Post-2000 that are presented in this Chapter, because for eGID relevant strategy-making, SMEs must now learn to make these connection and thereafter establish epistemic positions to develop appropriate strategies.

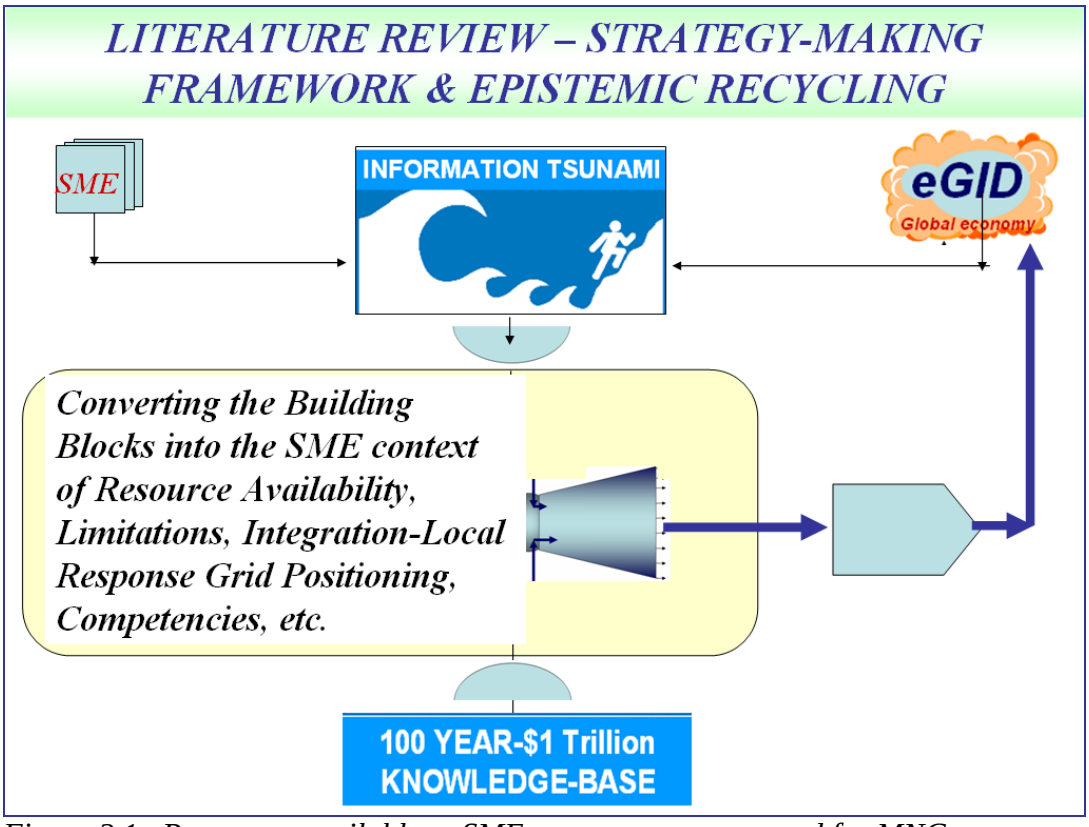

Figure 2.1 –Resources available to SMEs are resources created for MNCs

Figure 2.1 illustrates the context in which the Literature Review is being conducted in this Chapter. As illustrated, SMEs and the emerging Global Industry Domain (eGID) are at extreme ends of the epistemic landscape. Separating them are the 100 years of theoretic, academic and legacy-based teachings and Pre-2000 models and approaches to business strategy-making. Compounding the barriers even further are the new "Tsumaic" of information on the dynamics of the emerging global sector and the how innovative thought is succeeding in participating in eGID.

SME-strategy-making research therefore requires the development of "meta-strategies" which would enable SMEs to create innovations and participate in the global economy by mixing the Pre-2000 legacy system (of 100 years of academic endeavor) with the Post-2000 developments from reports on eGID.

At this it is briefly noted that significant difficulties exist for SME utilization of the Pre-2000 and Post-2000 strategy-making building blocks. The epistemic position on these SME barriers (which are further addressed in Chapters 5-8) is that this strategy- making resources have been created and developed by and for the express use of Multi-National Corporations over the past 100 years. Also this Pre-2000 knowledge-base has largely been created in isolation of SME needs and limitations. In a similar manner, the feed-back of knowledge and information that relates to the current Post-2000 demands of the global economy is largely the result of the reported experiences of Multi-National Corporations.

SMEs have on other option but to rely on the 100-year and $1 Trillion knowledge-base for the crafting of SME relevant strategies. The Literature Review therefore presents and reviews the

Pre-2000 and the Post-2000 epistemic building blocks that can be of potential benefit for SME adaptation and customization.

Finally in a departure from conventional business-strategy studies, the Chapter also studied the content-rich landscape that is available from non-traditional disciplines. The subject of Post-2000 Systems Biology is introduced into the Literature Review from an epistemic viewpoint, as a potential knowledge-base from which strategy-making concepts must develop for SMEs to innovate and create or participate in emerging industries.

The Literature Review chapter concludes with the recognition that the epistemic landscape of both traditional Pre-2000 and Post-2000 strategy-making building blocks are almost infinite in scale and scope. Their duality simply expands the epistemic challenges confronting SME strategy making. The Chapter therefore concludes on the note that new learning and behavior are necessary. The epistemic duality cannot be ignored because each discipline differentially addresses the strategic for SME relevant strategy making and innovation creation in newly emerging global industries.

2.3 Review the Theoretical-oriented Business Strategies

In the first of the 4 "sectors" offering insights on "Strategy-making building blocks", the focus is on the legacy models. These have largely been built-up by Academia, over the past 100 years and which are estimated to have cost over $1 Trillion – a sum that has been involved in training, development, publications, education, etc.

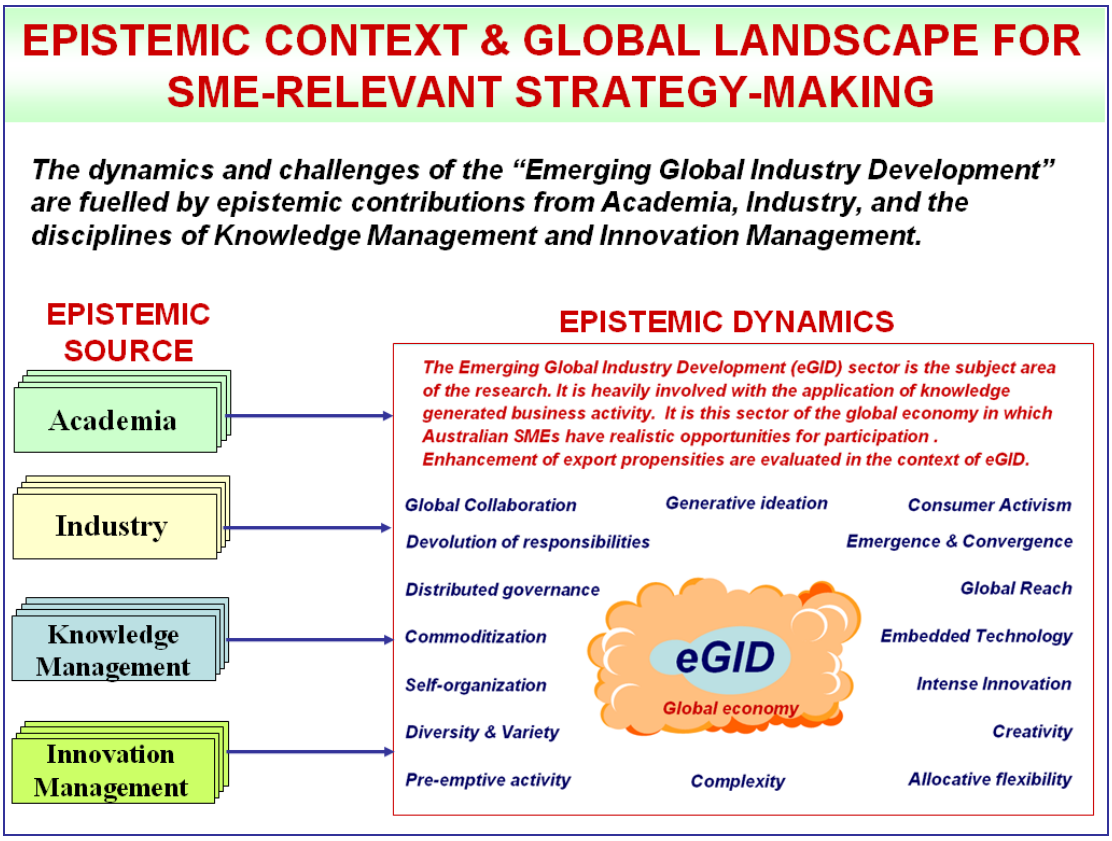

Figure 2.2 Epistemic context between the emerging global industry domain and the strategy-making building blocks for SME innovation

Figure 2.2 illustrates the epistemic landscape and the connections between the issues discussed in Chapter 1 and the 4 sectors of "Strategy-making building" blocks within the Literature Review being conducted in Chapter 2.

The lower right section of the illustration presents the challenges and the characteristics of issues faced by SMEs wishing to innovate and participate in the emerging Global Industry Development sector, or the "eGID". The landscape is a mixture of Pre-2000 and Post-2000 models and perspectives as a result of the epistemic contributions made by new and existing global entrepreneurs, academic experts, strategists, innovators, agents and the management of global firms and their consultants and expert advisers. The epistemic confluence of their ideas, concepts, business models, delivery systems, and communication methods and fulfillment mechanisms make up the dynamics and complexity of the eGID landscape. A group of such contributions from the "Academic" sector are now presented, as representative of the areas

fromwhich SME will need to create strategy-making efforts for innovation and participation in eGID.

2.3.1 SWOT Analysis Approach

Strategy-makings dogma is that all organizations must develop strategies that can deliver a "strategic-fit" between the organization and the markets within which it wishes to participate. The Strategic-fit criteria is therefore strongly integrated with the equally strong dogma of "SWOT" analysis that all firms need to conduct before strategy making.
SWOT – are the starting letters of :
- Strength – Internal competencies in the organization to develop new product or new process innovations
- Weaknesses that involve internal factors are preventing or limiting the development of such innovations
- Opportunities – relating to external factors in which the innovations could be commercialized in a relatively short time-frame
- Threats - that involve external barriers either preventing the commercialization of the innovations, or delaying their deployment.

It is in this SWOT context that Figure 2.3 illustrates the differences in the SWOT situation between SMEs and other non-SME firms participating in eGID. In the I_R Grid first proposed by Professor Prahalad, the X-axis represents the "R" or Response factor – the degree to which any firm is responsive to the needs of the markets within which they are geographically located. On the Y-axis, the "I"-factor represents degree to which the firms management systems are integrated in an effective manner, to service the different local markets within their global portfolio. Global firms such as "Microsoft" for example exhibit high degrees of managerial integration while being relatively remote from some of the geographically dispersed local communities. Trans-national firms by contrast make a major effort to maximize local response and managerial service delivery and fulfillment integration. Multi-national corporations (MNC) have this dilemma in choosing to be a Global firm or a "Transnational Firm" – the challenge being the cost of increasing the degree for higher levels of local response.

SMEs as illustrated in Figure 2.3 are almost on the base-line of the I-R diagram, and their native territory is on the local response criteria.

Hence any plans for innovation or eGID participation must consider the Strategic-fit issues as well as the SWOT issues if SME innovations for emerging global industries are to succeed.

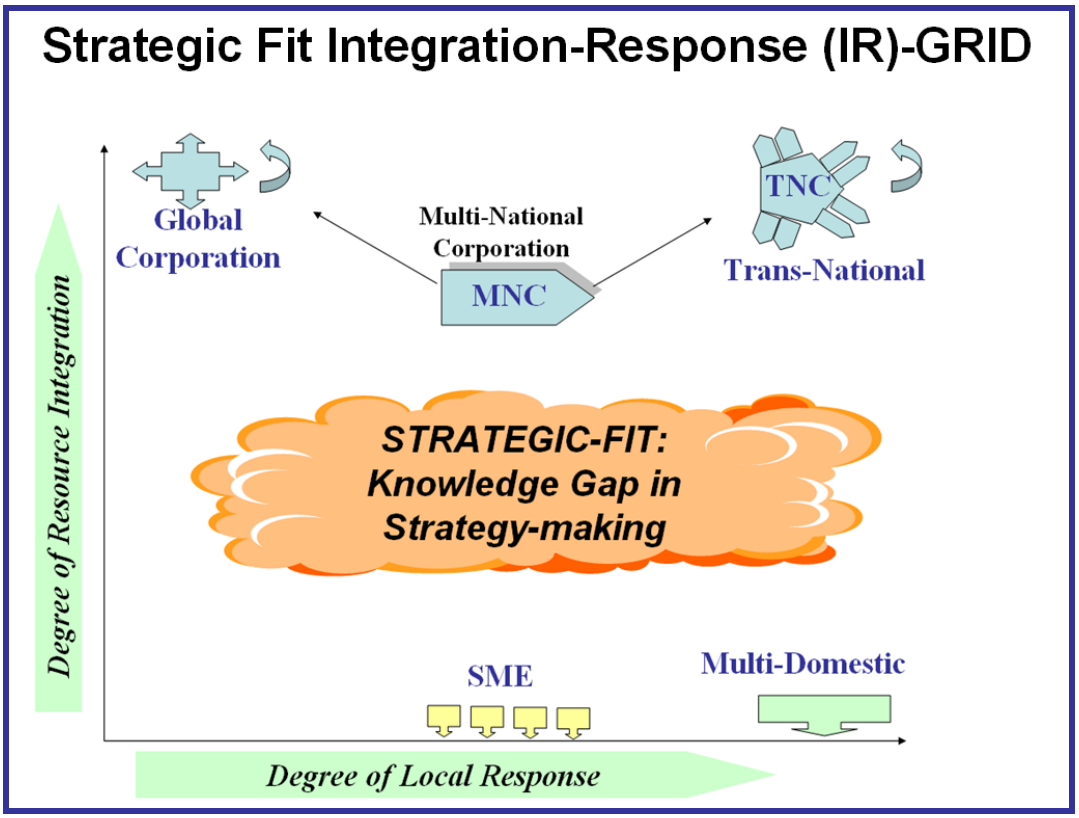

Figure 2.3 – IR-Grid and Strategic Fit context for SMEs and SWOT comparison with other non-SME firms.

2.3.2 Core Competencies based Approach

Ground-breaking ideas for strategy-making were presented in the 1980s by academic experts and thought leaders such as Porter, Mintzberg, Prahalad, and Driucker. In their book Prahalad and Hamel (1990) argued for the concept of " The core competency of the corporation" as a mandatory requirement for strategy-making.

Providing repeated case studies and examples, they contended that strategy making requires the combination of skills, "competencies" and knowledge in the areas of technology, resource mobilization, manufacturing, material science, and miniaturization. The manner in which "core-competency-based" strategy-making has been successfully delivered by Japanese Multi-national firms are presented in the following illustrations

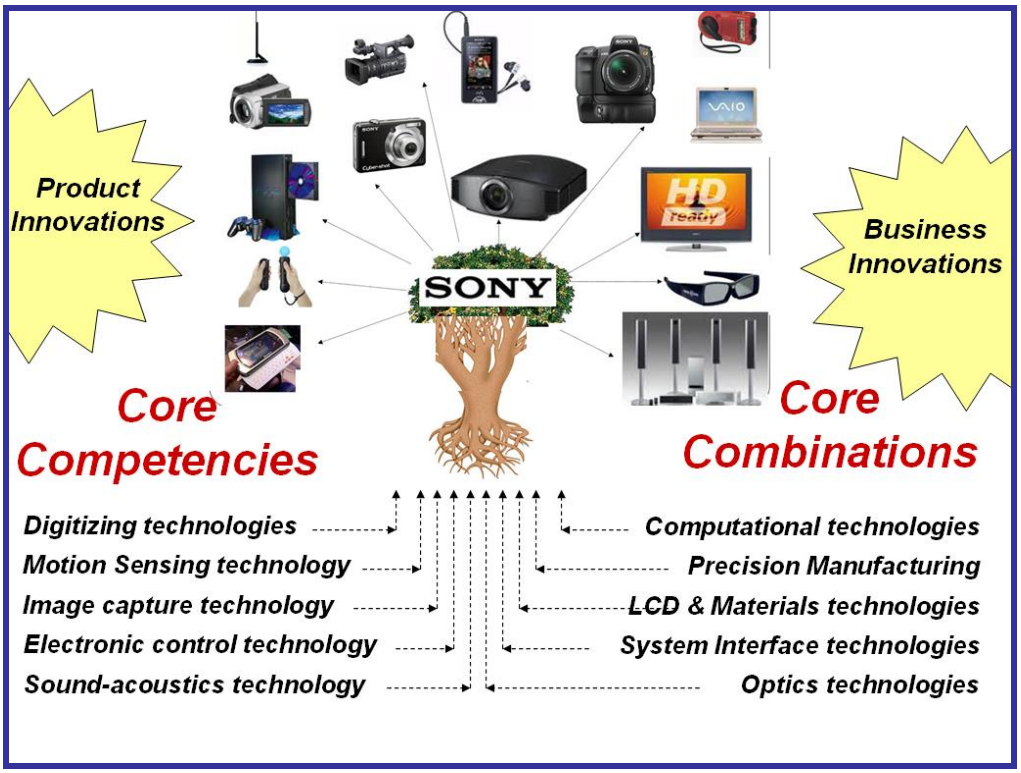

Figure 2.4 Sony's application of the strategic-concept of the "Core Competencies of the Corporation".

Figure 2.4 illustrates the factors and the skills and competencies that explains the successful manner in which the Sony Corporation appears to have implemented strategy-making based on the Core Competencies concept first presented by Prahalad and Hamel. In the drawing, the lower section, represents the roots of the epistemic tree – while the upper section represents the fruit of the firm's efforts – the fruits of innovation by the Sony Corporation.

The epistemic roots involve technologies and expertise that relate to functional areas and technological domains and industry disciplines such as digital technologies, imaging, electronic control, industrial design, material technologies, manufacturing capabilities, precision design and parts integration, etc. Firs such as Sony possess almost all of these "departments" that would have been required in the first portfolio of innovations. The Core Competency concept argues both for the retention of such "department specializations" but also for their combination in multiple fashion, to form the basis for new products and new process development.

The different new products illustrated in the upper section of Figure 2.4 are nothing but the result of such core-competency "Mix and Match" strategy-making. New products that appear to be disparate are indeed inter-related by the "root-zone" core competencies.

The success of the firm is directly related to the successful management of its core competencies. From an epistemic perspective it requires that the "epistemic roots" should be nurtured, so that the root zone can produce further "Mix and Match" combinations that will result in the abundant harvesting of the fruits of innovation with new product and services.

In Figure 2.5 the same epistemic perspective of the Sony firm can observed with the Honda Corporation. Again Honda's new products and new services and the delivery systems can be best analysed for strategy-making by visualizing the firm's relatively hidden "root zone" of core competencies in Honda's tree of knowledge. In the metaphor, the end-products of both Sony and Honda are the fruit of the tree, which is generally the most observable outputs for end-users, resellers or the channel partners.

Therefore for any Original Equipment Manufacturer (OEM) that strategy-making viewpoint is that its core competencies are the innovation-engine of the firm. The roots of the tree of knowledge need to be enriched to generate a more varied and profitable harvest of fruit (product-innovations).

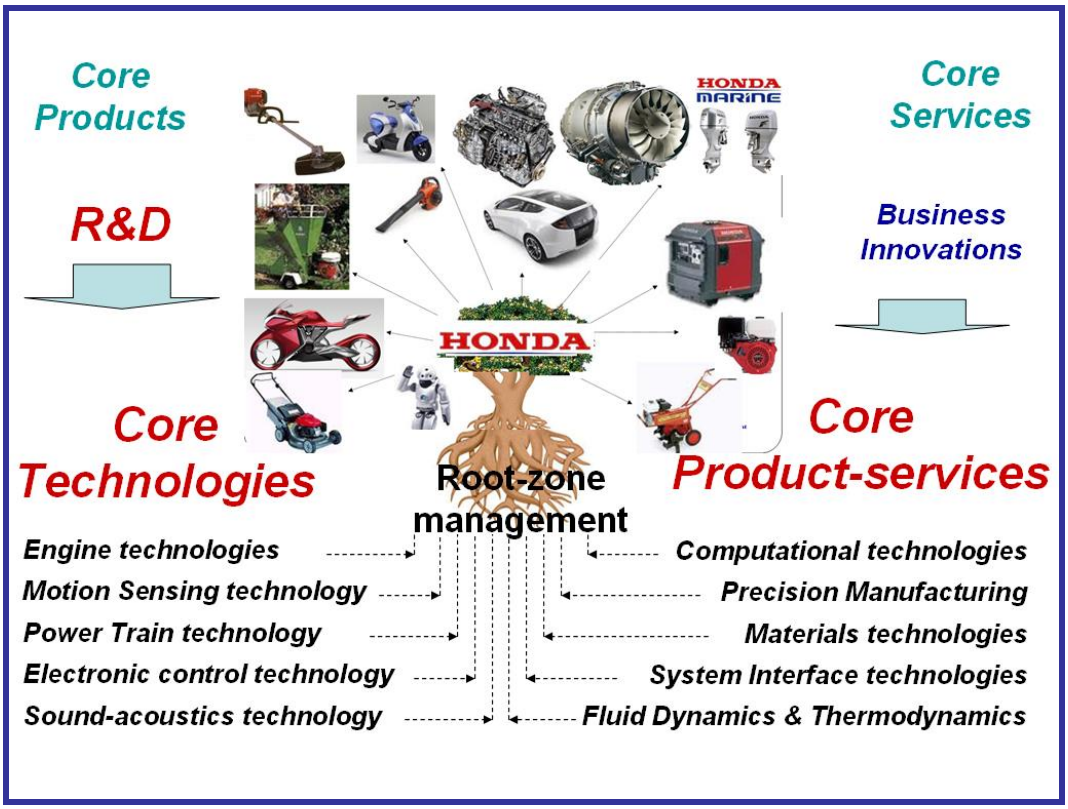

Figure 2.5 Strategy-making at Honda Corporation using the "mix and Match" strategy making with Honda's core competencies

Figure 2.4 and 2.5 also illustrate the strategic thinking that has been responsible for the near serial-approach and industry dominance with quality innovations from boith Sony and the Honda Motor Corporation. The metaphor of a "knowledge-tree" involves the fruit being the "repeat" innovations in the portfolio of new products that can be successfully released to the market in a serial manner.

Extending the core concept to the Apple Corporation also explains how the successful nurturing of the "root zone" will result in repeat innovations – with each successive innovation out-besting

the earlier versions or models. The greater the attention placed on the core competencies-root zone the greater the potential for the new product range to be expanded in a consistent manner.

The lessons for SME strategy-making is the manner in which "meta-knowledge" can be attained by SMEs for the strategic mixing of the core technologies and services within the root zone. The common resources available to the SME firm or a business ecosystem with which the SME collaborates should be integrated to deliver the launch platform for innovation development.

The lessons for SME strategy-making and for innovation for eGID are therefore straightforward:

- Core competencies are the well spring of new business development
- Core competencies should be the focus of strategy development
- Core competencies need to be detailed in management plans
– Plans should not be limited to NPD (new product development)
- Strategies should also embrace integration with external competencies for the development of strategic architecture for eGID innovation and participation
- Meta-integration should be the focus on integrating the competencies of the SME, its partners and suppliers
    - Co-creation of the potential or possibilities of customers in joint action should be the grand extension of the concept of core competence.
- Core competencies need to be developed to manage the crossing of Market boundaries and the shifting of boundaries in dynamic fashion

Christiansen, et. al. 2005 have presented a new perspective arguing for the development of an "Integration of Knowledge-based Competency" for New Product Development. Their constructivist view point argues for the aggregating of competencies that need to be interpreted, selected, mobilized and managed after knowledge-based studies of those competencies. As they would relate to eGID, the knowledge-competency-integration for eGID relevance would require knowledge interpretation ofeach of the PEST forces, It would also require interpretations of specific micro-industry forces, and knowledge-based interpretations of the successful strategies and innovations by global operators of the eGID.

Procuring, embedding and embodying such aggregated knowledge for the delivery of innovative outcomes from such knowledge ecosystems represents a clear point of departure for new Post 200 product development.

2.3.3 Core Capabilities Focused Approach

Core capabilities are defined here as the extension of the "internal" core competencies by expanding them with the "internal competencies" of external firms – so that the aggregate of internal and external competencies can deliver a futher range of innovations.

Prahalad and Hamel (1990) and Javidan, Mansour (1998) provide further advice for extending the type of "Core Capabilities" strategy-making building blocks required for SME eGID innovations. In this case NEC, the Japanese multinational corporation is the proof of successful

innovation creation through the use of the core competency strategy-making concept – with "internal and external Mix and Match" combinations. NEC builds and aggregates / integrates NEC's core competencies in business activities spanning semiconductors, telecommunications, computers- mainframes, desktops and notebooks; mobile phones, and office automation products

Once despised as a diversified unit, with the need to 'stick to the knotting', core competencies enables the re-defining of the knitting system itself. The lesson for SMEs is therefore to maintain and manage its obsession with "internal and external" competence building, because it will be the determining factor that characterizes the global winners of the future

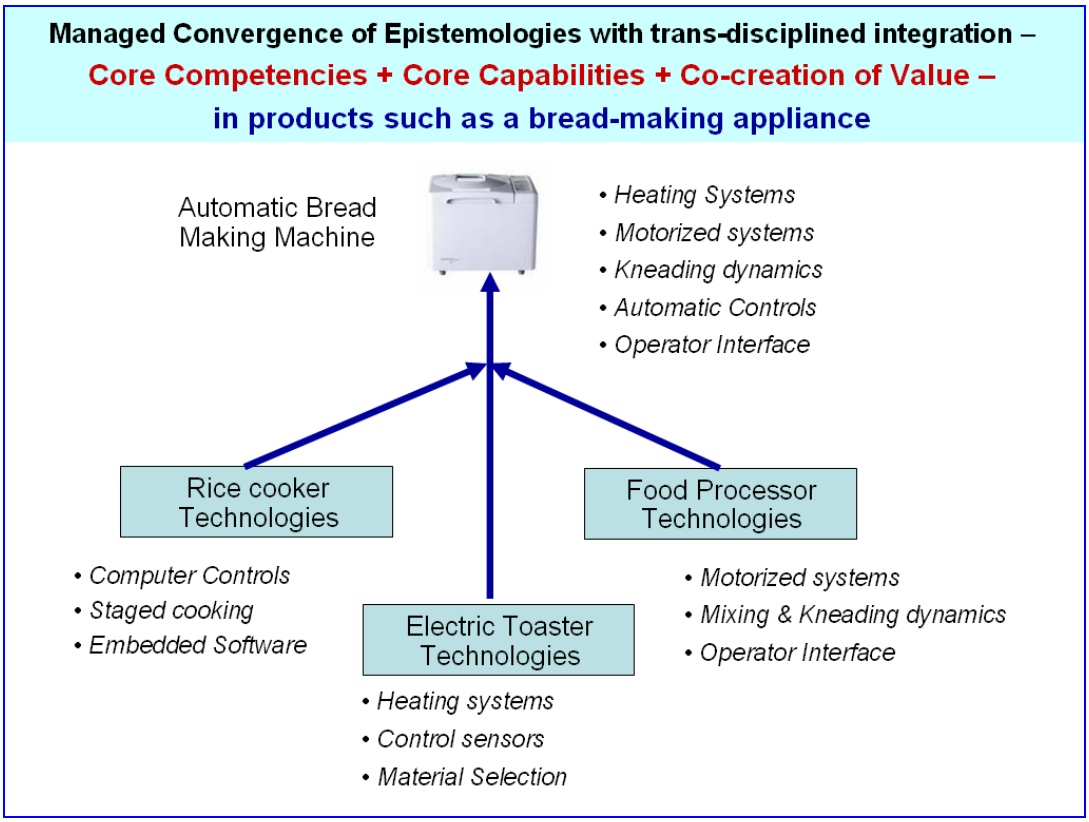

Figure 2.6 – Innovations with Core Competency "Mix and Match" strategies in Bread-making machines

The concept of "core capabilities" that meta-combine the "core internal competencies" of disparate units or entities is illustrated in Figure 2.6. The internal skills of electronics, digital control, and motorized technologies (internal to firms such as NEC) are combined with the external skills of Food-processing firms who understand the need for ingredient mixings, yeast / microbial transformations, temperature staging, and environmental control.

The lessons for SME strategy-making are therefore the need to achieve "meta-integration" of competencies from both internal and external enterprises.

The success of the NEC corporation is best explained by the "meta-integration" capabilities that NEC builds /aggregates / integrates NEC's core competencies in its range of "Strategic Business Units" and in the external firms considered a part of the NEC family. Using the "meta-integration concept of strategic alliances, the portfolio of business activities spanning

semiconductors, telecommunications, computers- mainframes, desktops and notebooks; mobile phones, and office automation products are woven into an "innovation generating machine orplatform".

Once despised as a "too highly" diversified unit, with the need to 'stick to the knotting', the meta-merging of the core competencies enables the re-defining of the knitting system itself. Obsession with competence building will characterize the global winners of the future.

2.3.4 Co-configuration based method

SME strategy-making is based on the concept of Co-Configuration – the emerging new and "organizational and knowledge development Platform" for Re-framing, Re-combination, adaptation – to collaboratively put together and maintain a complex New Product Development (NPD) system which can adapt to the changing needs of the user and global market demands. The required structures and methodologies for mobilizing such strategic approaches have been offered by Ramaswamy and Gouillart (2010) in their book titled "Building the Co-Creative Enterprise" in which the underlying mechanisms are of cooperation, co-configuration and sharing of resources between business ecosystem membership. While such strategic frames are clearly valid in the context of eGID and Multi-national Corporations, the framework is incomplete in how SMEs can benefit from it in a "ready-to-use" format. By contrast Case Studies of the type by Guillén, and García-Canal (2010) could be of moe relevance to SME strategy-making success. In the one case high level thinking can cover more ground but is harder to implement than the specific case that is more restrictive. Clearly an epistemic deficit exists on the issue of balance in the reporting and supply of resources for Co-configuration management.

2.3.5 Porter's 5-Forces Strategy and Value Chain

Porter's 5-forces Strategy and Value Chain addressed industry forces and "strategic fit". Suggested that firms should consider the option of moving into the more lucrative business domains rather than struggle with a highly competitive environment with marginal margins.

Figure 2.7 – The Elements of the Porter Value Chain

Figure 2.7 illustrates the foundation of the curriculum of strategy studies in most undergraduate and MBA courses around the world. First proposed by Professor Michael Porter (in 1985), the Porter Value Chain is an ideal framework in which any the strategy-making issues of firm can be conceptualized. The Porter Value Chain's nine activities follow the pattern of goods flow from procurement through to the In-bound Logistics activities, by which the purchased goods are delivered to the Original Equipment Manufacturer.

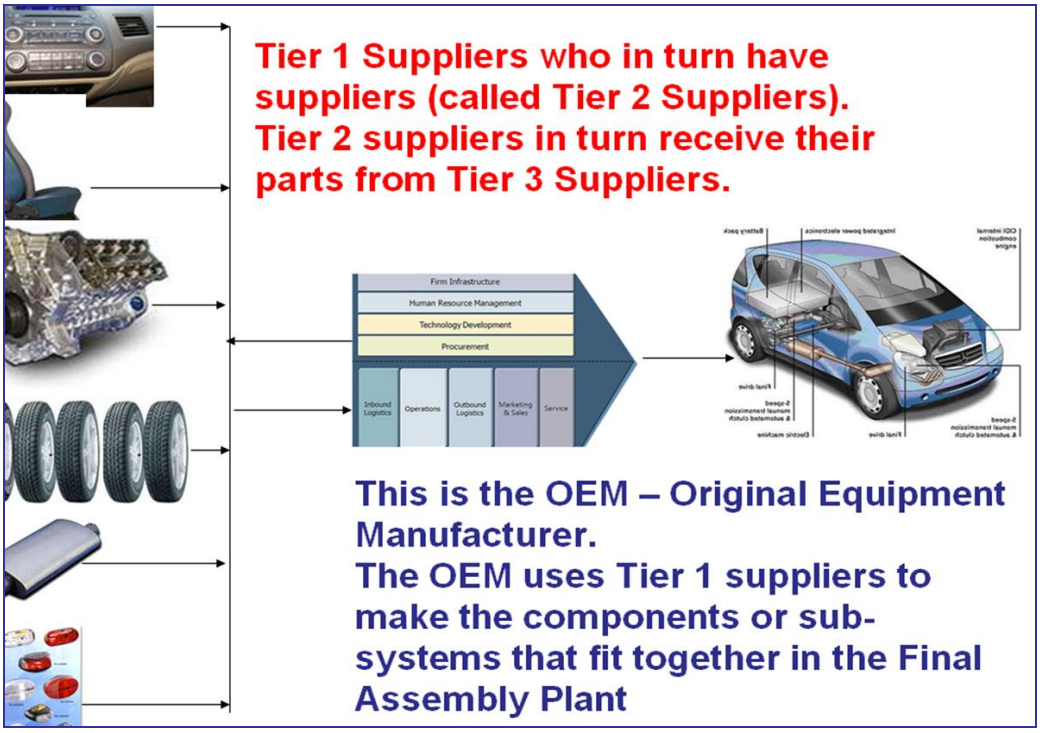

Figure 2.8 – Applying the Porter Value Chain to an automotive supply network

For SME strategy-making, the Porter Value Chain and its types of extensions (Figures 2.8 and 2.10) into supply chain networks are logical conclusions, well received and understood with relative ease. Figure 2.8 for example is accepted as the minimum level of knowledge required for participation in business ecosystems, The separation into " Tier" levels as Tier 1, 2, or 3 suppliers are also basic industry ccepted terminologies. The problem however with SME strategy-making is how this generically common concept can be transformed into innovative platforms for delivery of new and innovative products and services. If all are using the same concept,the strategic question is therefore on how to achieve the differentiation in global customer loyalty and competitor dominance.

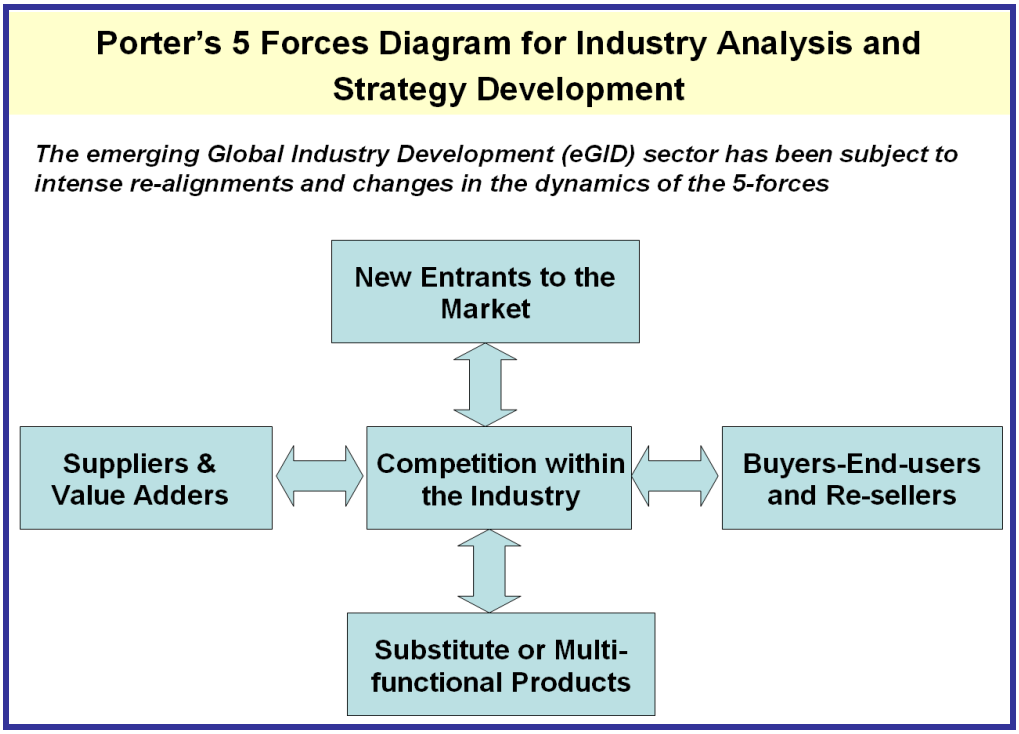

Figure 2.9 – Porter's Industry forces and the lessons for strategy-making

Porter's 5 Forces strategy-making concept (illustrated in Figure 2.9) does provide insights into how this differentiation can be achieved. Again however the concept has reached a fair degree of maturity within academic carricula and in industry work-force understanding. The ever remaining challenge for SMEs again focuses on how to achieve differential advantage – a competency and state of business strength that Porter himself has strongly expoused in his research, text books and global consultancy services. SMEs can therefore be forgiven for aligning themselves with Coleridge's Rime of the Ancient Mariner "Water, water, everywhere, nor any drop to drink".

2.3.6 Supply Chain Oriented Strategy-making approach

3PLs, Demand Managed Supply chains, Vendor managed Supply Chains, are also well known approaches to business strategy-making.

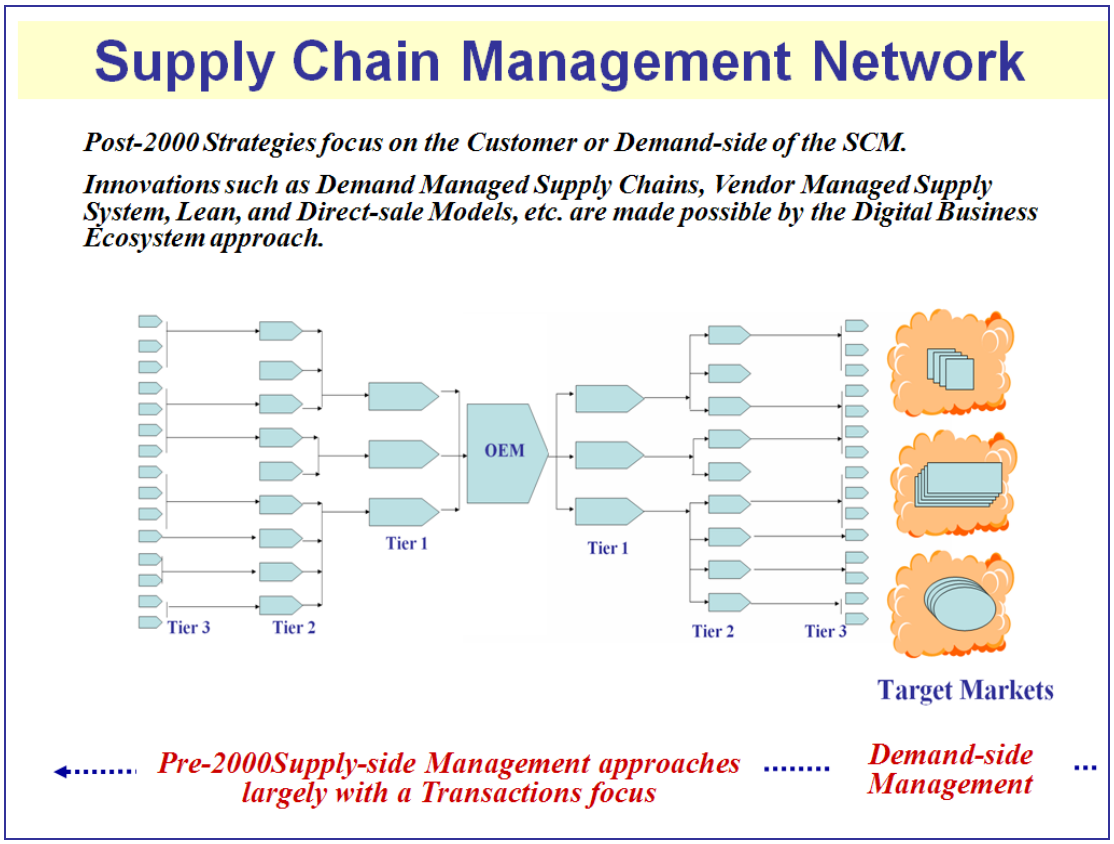

Figure 2.10 – Combined supply and Distribution function into a Supply Chain Network

Figure 2.10A illustrates the typical supply chain network that involves the aggregation of the individual value chains that are categorized in the supply or the demand side of the central firm that organizes the suppliers and the distribution partners. The direction of the flow of goods is from the left to the right of the diagram. The OEM or Original Equipment Manufacturer is responsible for organizing the suppliers and the distributor channel partners. In the Pre-2000 business era, most OEMs did indeed manufacture the main components and integrated the other sub-components in the OEM's assembly plant. The entire collection of suppliers, in conjunction with the OEM and the distributors made up the supply chain network.

Demand Managed Supply Chains is a strategic approach commences with the Customer or consumer end of the supply chain network and works in a counter direction to the flow of goods within the same network. The demand at the consumer end is monitored by aggregating the actual sales made by the retail outlets selling the product. The frequency of the monitoring process can be instantaneous depending upon the set-up of the "Demand-driven" computerised infrastructure. The recording system of sales made at Point-of-Sale machines can be intercepted either in parallel with the updating of the corporate database, or from the integrating database itself.

Application software routines then analyse the data for each product SKU and generate reports, exchange information, and or issue automated calls to other computers. The demand management program's sub-routines aim to keep the product-supply pile line replenished at a rte that is synchronised with the actual purchased demand.

2.3.7 The OEM-ODM Phenomena

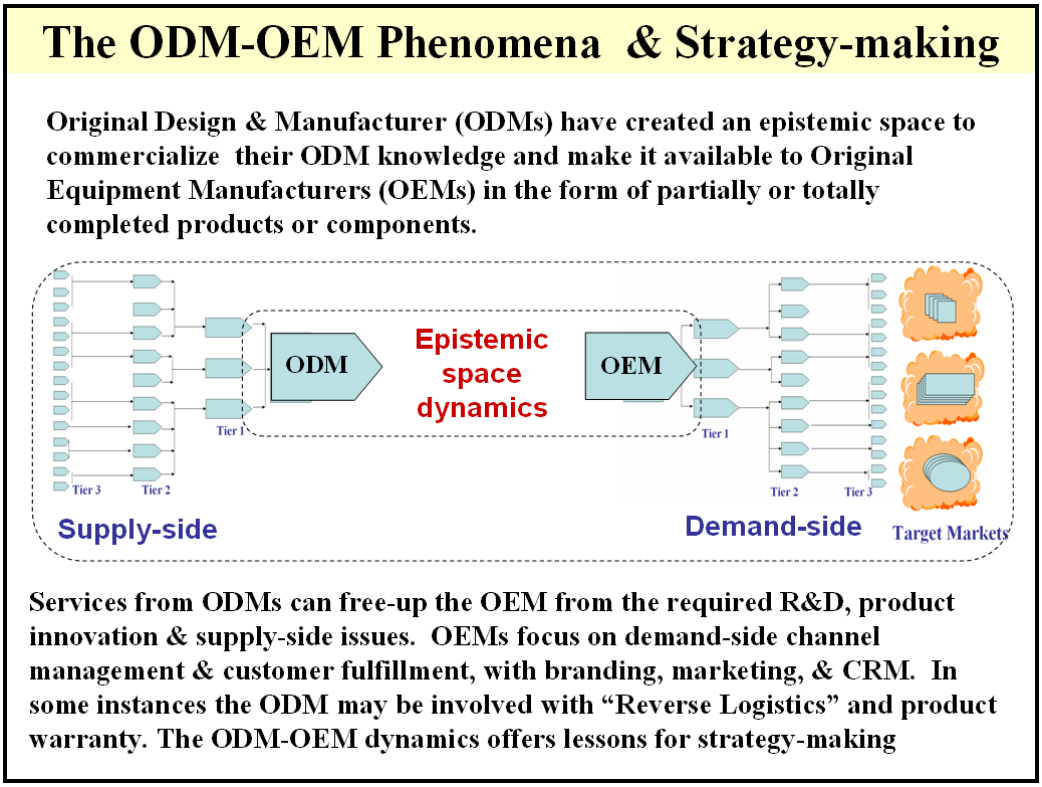

Figure 2.11 – The Post-2000 adaption of the Supply Chain with original Design and Manufacturing roles

Figure 2.11 illustrates the workings of the Post-2000 proliferation of the business concept known as "Original Design & Manufacturer or ODM". The phenomena is the juxtaposition of the ODM with the relatively well known concept of the "Original Equipment Manufacturer or OEM". The ODM functions as the OEM's defacto procurement, in-bound logistics, manufacturing and outbound logistics sub-contractor. The phenomena however starts to occur when the ODM takes on additional responsibilities of product design and development including the creation of new innovations and functionality within the sub-contracted product supply contract. The dynamics of the epistemic space between the ODM and the OEM can be intense with true business ecosystem approaches for mutual growth and benefit. The challenge is to develop strategies that can initiate and encourage this dynamic for SMEs, especially when the SME knowledge-base on the surface may not be able to match the offerings of the ODM.

The Original Design Manufacturer (ODM) business concept is a more recent advance over the Porter Value Chain's use of the Original Equipment Manufacturer (OEM) context. The variation arises because the ODM functions as the hidden manufacturer supporting the OEM. Products manufactured by the ODM are branded to suit the OEM. The ODM is therefore responsible for all of the innovation development that becomes manifested as generic innovations for the range of OEMs wishing to utilze the products and services of the ODM.

A significantly large segment of the eGID landscape within which SMEs must compete is actually the result of the inputs made by ODMs to almost all of the leading Multi-National Corporations whether they be Apple, Sony, Hewlett Packard (HP), or other Siemens. It is in the research establishments of the ODMs that the innovations are created. Nike and other shoe original OEMs like Addidas initially started the ODM phenomena by first outsourcing portions of manufacturing and services, before finally switching to the full ODM model. Taiwan China for example for example boasts a significant share of the electronics and computer system ODM products.

2.3.8 Balanced Score Card and Strategy Maps

Kaplan and Norton's ground breaking business model and framework has been acknowledged as an integrating framework that brings together separate sections of business strategy studies. The value of the Balanced Score Card resides in their with the hierarchy of Learning, Process Utilization, Customer Value Delivery and the exchange for Financial deliverables

Balanced Score Card provides a heuristic for the identification and development of the core competencies needed by the K-ecosystem, based on the strategic intent and the Co-Value Propositions forming the agreed strategy. Scenario Planning and the need for metaphors to assist with the visualizations of risks and hazards for strategy formulation

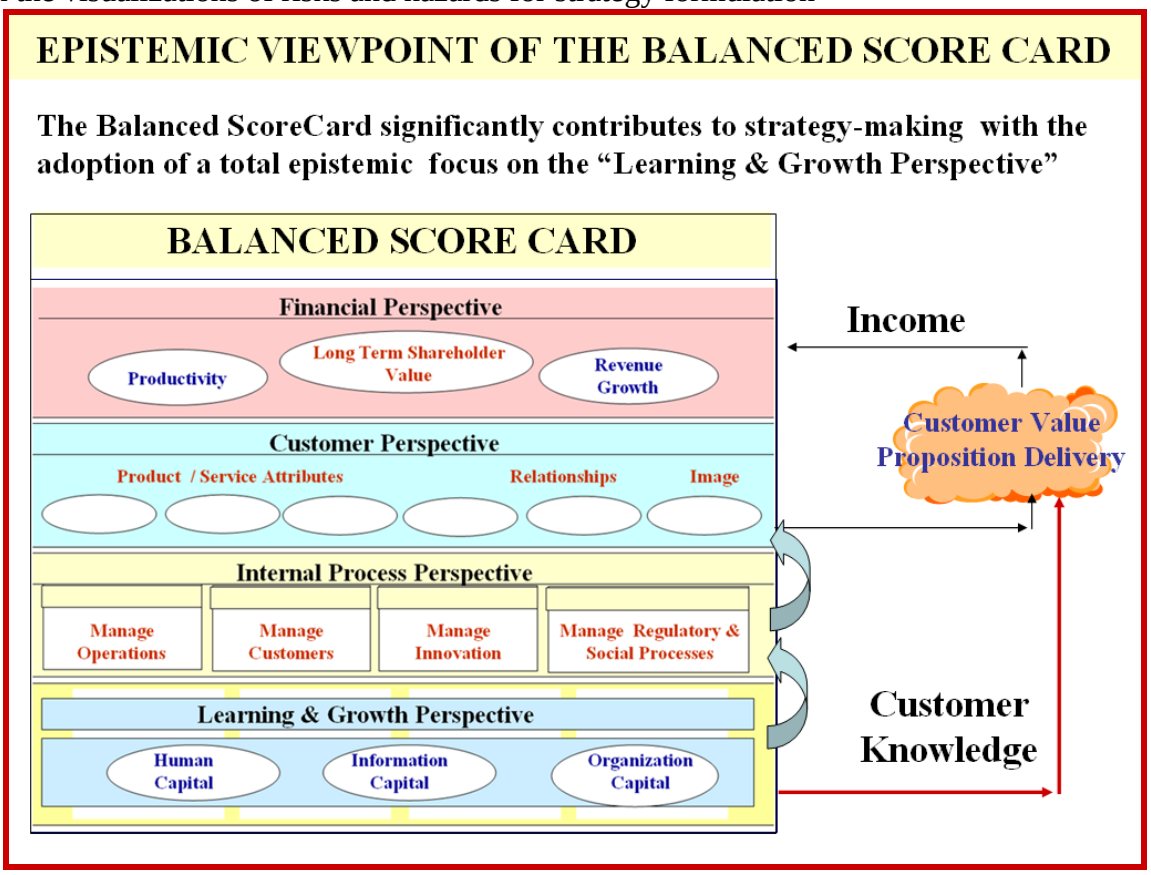

Figure 2.12 – Strategy-making facilitation by the Balanced Score Card and Strategy Maps.

Figure 2.12 illustrates the scope for making the Balanced Score Card significantly more appealing and effective for SME strategy making. The generally accepted view of the Balanced Score Card (on the left of the diagram) is that model can be considered on a stand alone basis. All of the 4 perspectives of Finance, Customers, Processes and Learning are generally considered to be of equal importance. However by adopting an epistemic perspective, it becomes clear that the key role is actually delivered by the Learning and Growth Perspective. It also becomes more transparent that it is the Learning perspective that in effect initiates the start of the Balanced ScoreCard's overall system. Specifically the learning and knowledge of the customer-base and customer mind-sets functions as the bridge between the Customer Perspective and the Financial Perspective.

However as illustrated in Figure 2.13, multiple and transdisciplinary issues are embedded within the concept of "Customer Value Propositions". On the right of the diagram is the key to understanding what drives the end-user and customer . It is the physiological and the psychological needs of the customer – which requires a mind-set on its own to understand the mind of the customer and the issues withinin that create and characterize customer value propositions. The net effects of these mind-sets are shown on the left of the diagram.

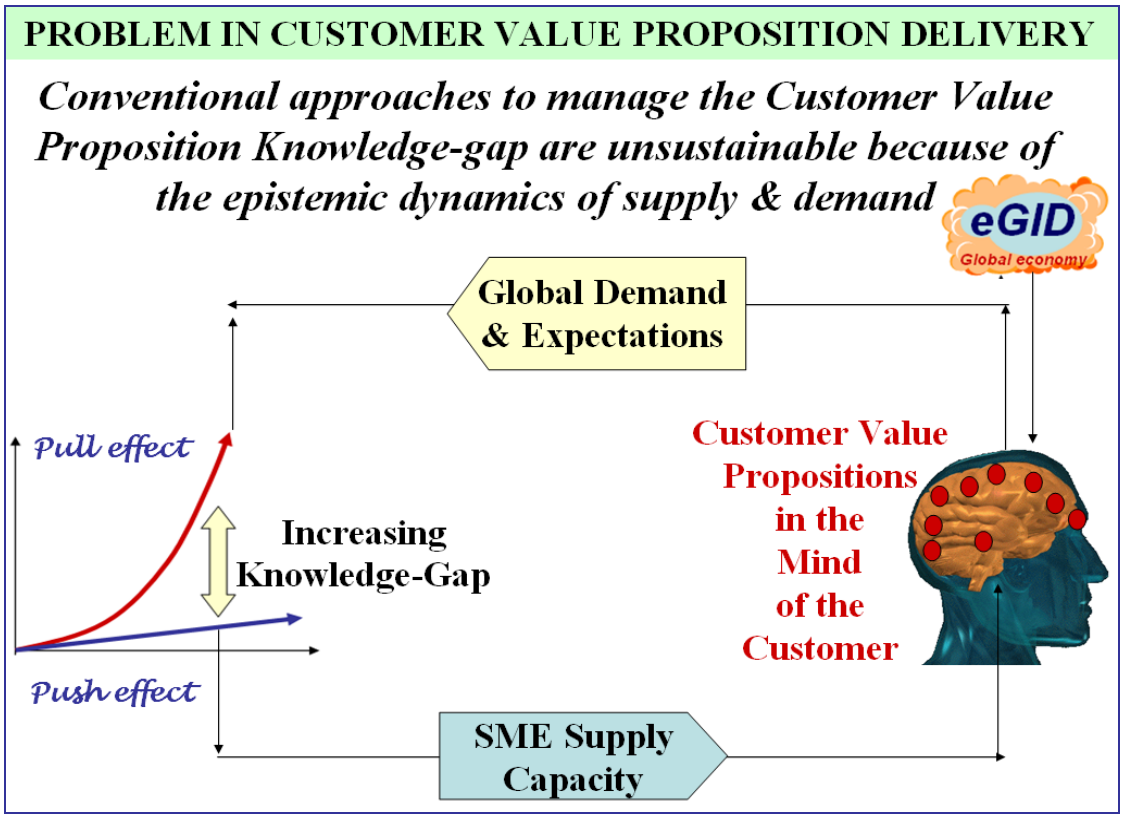

Figure 2.13 – The gradual introduction of the Mind into Supply Chain strategy making.

The mind-sets of the customer, when globally integrated into a commercial market sector (on a global or territorial region) actually produce the "Demand-side" curve of Customer Value Propositions. Strategies and solutions need to be offered to satisfy the aggregates of such global demand mind-sets which are transformed into Marketing-speak "Value Propositions" . Simulataneously the lower curve on the left diagram is the aggregate of the capacity and competencies of the SME to develop strategies and solutions that need to satisfy the Demand

Curve. Without an understanding of the originating issues and the dynamics of the global mind-set, appropriate delivery strategies cannot be created. There will continue to be a "Knowledge Gap" - only in this case, the Knowledge-Gap specifically realtes to the delivery of Customer value propositions. The key requirement for success with strategy-making that is embodied within the "Balance Score card" system-concept is therefore directly related to trans-disciplient knwoeldge management and business management issues.

2.3.9 Business Ecosystems

SME strategy-making objectives cannot ignore the phenomena of Post-2000 global business and its prolific dependence on the concept of "Digital Business Ecosystems". It is the Post-2000 representation and characterization of the physical supply chain but with the underpinning of a digital technology resource-base. The digital resources provide the enhanced communication systems, the data exchange processes, the monitoring of transactions, the exchange of signals in real-time mode, and the payment for transactions, etc. The virtualization of commerce is made possible by the use of digital technologies that are further enhanced by the communication and transmission functions offered by the Web and related internet technologies. All of the physical activities of the Pre-2000 and Post-2000 strategy-making business concepts, models, and building blocks can be woven into unified entities that make for a collaborative business ecosystem. Within the ecosystem, the different entities trade sections of their self-interest for the common good. They benefit from the growth of the ecosystem – when the ecosystem profits, its membership profits.

SMEs considering the concept of the Digital Business Ecosystem need to ensure that their strategy-making balances both the physical with the technology's potential for facilitation and transformation of the physical into to digitized versions. The range of candidates for digital business ecosystem transformation is endless, and SMEs would need to include the following for innovation creation and development:
(i) Multi-sided markets with "Born Global" and "meta-national" approaches for utilization of the business ecosystem concept
(ii) Mass-customization and proliferation of the business innovations in offereing-modes where volume x lower p
(iii) Cognitive representations as Business Models, Strategies, Elements, Platforms, Chains, Cycles
(iv) Application software such as Product Life Cycle Software, CRM Software, Business Analytics and Dashboards, Web 2.0 technologies for 2-way interactivity, Software As A Service, Social Networking, and so called "Cloud Computing"
Ecosystem management

The existiance of Meta- National Ecosystems are inceasingly achieving visibility and membership and cliente on the scale that demands SME strategy-making objectives for their survival and profitability. Figure 2.14 for example illustrate the business ecosystem consisting of global buyers and sellers interacting and transacting on the eBay Internet Platform. Again while the operational principles are now more easily understood – for one of sale or purchase of discretionary items, the challenge for SME strategy-making is to develop coherent policies and programs that embrace the sale of made-to-order and made-to-stock items, for delivery through such Intenet-based platforms.

The restricted use of such platforms for disposal of unsold stock or redundant items or "seconds" is the equivalent of a lazy-person's response to a key Post-2000 facility that is increasingly shaping the mind-sets and the customer value propositions that will determine success or failure of SME firms.

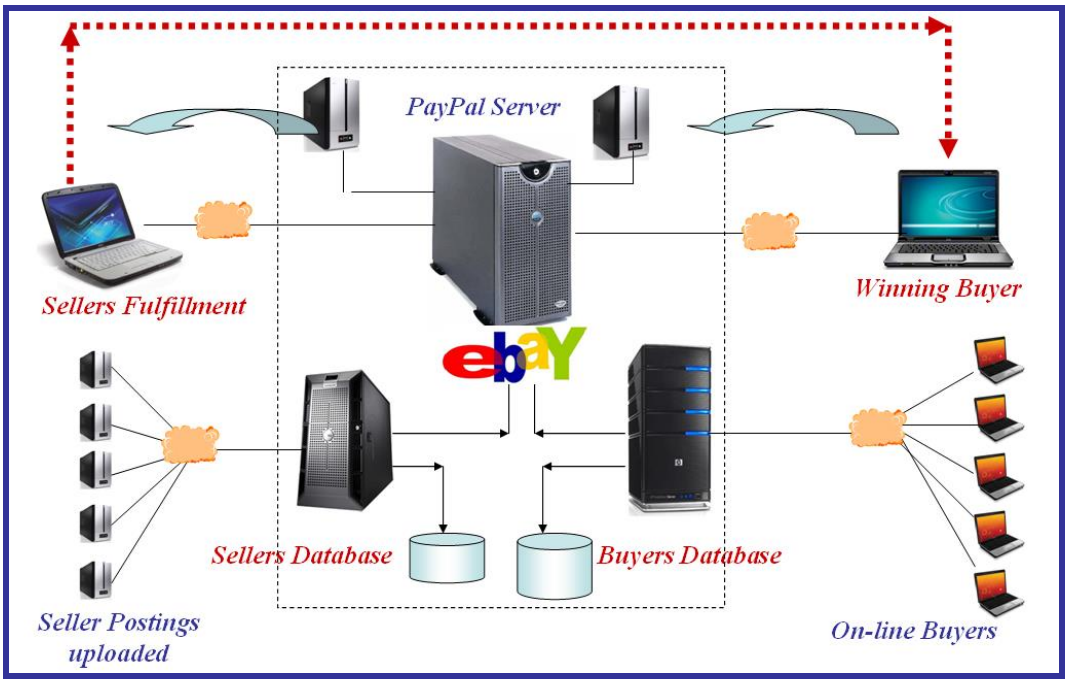

Figure 2.14 – Business Ecosystem example mediated by Digital and Internet technological innovations.

Hybrid-business Ecosystems that capture the innovative thinking of founders such as Mr Gerry Harvey of the Harvey Borman chain of department stores in Australia is deserving of analysis in the context of SME strategy-making that embraces strategic issues of global and local significance. In Figure 2.15 for example, and in the right of the diagram are illustrations to represent the portfolio of Harvey Norman branded Stores. Each store is in effect a collection of franchises of 4 to 6 separate or distinct businesses. Each operates ont their own under the general Harvey Norman umbrealla – focusing on electronic goods, or white goods, or bedding of furniture, etc.

The strategy being implemnted is to offer a seamless collection of stand-alone "retailers" who have been contracted to benefit from the collective buying power of their equivalent-industry retailers who together make up an industry-specific portion fo the Harvey Norman business model. The Procurement stategies of the Harvey Norman Value chain is bsed on integrating the expected demand that each retailer predicts and then leveraging their combined buying power when dealing with global suppliers such as Samsung, LG, Philipps, etc. Fulfillment strategies for In-bound and Out-bound logistics relative to the Group are similarly manged by the Management Information Systems so vitally important for dispersed retail store operations.

The success of the Harvey Model Business Model is underpinned by the agility in producing within their own TV studios, the Radio and TV commercials that are in a "ready-to-air" condition to inform customers of their special deals of No Interest payments for 500 days or a 1000 days or so. In tis manner, Harvey Norman's business ecosystem embraces a range of SME

firms who are contracted to deliver almost all of the Vale Chain's operations apart from the Global Procurement functions and the management of the overall Business-ecosystem.

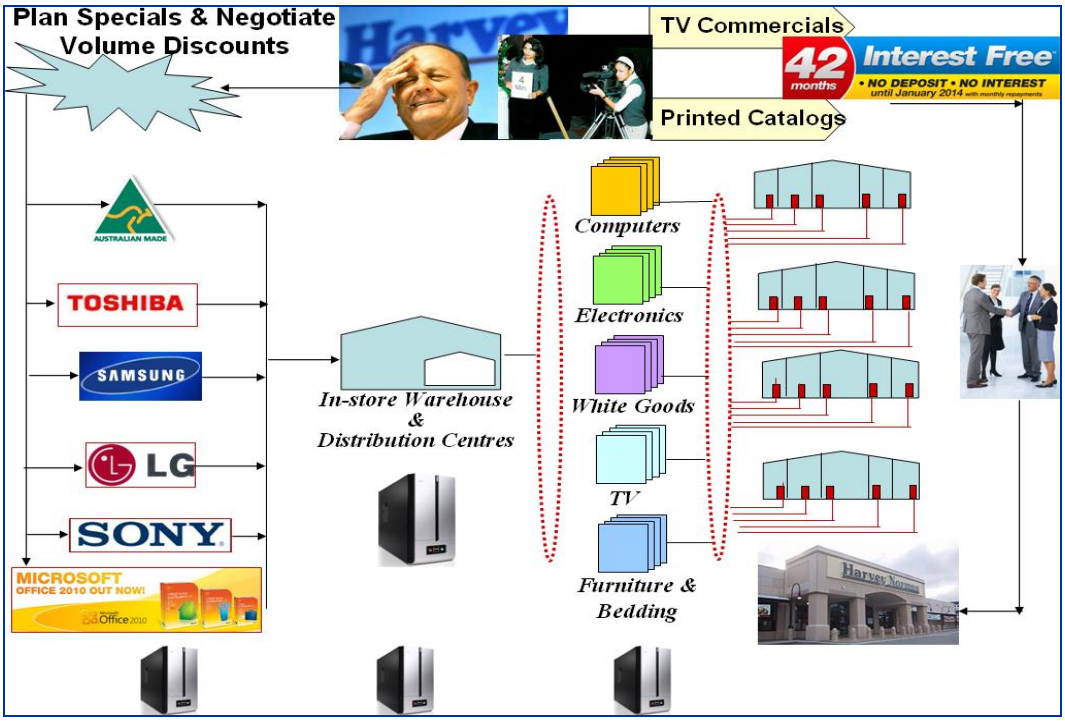

Figure 2.15 – Deconstructing business models for Strategy-making – the Harvey Norman Case

Recently however the Harvey Norman Business Ecossytem Business Model has been under competitive pressures, and the challenge needs to be analyzed.

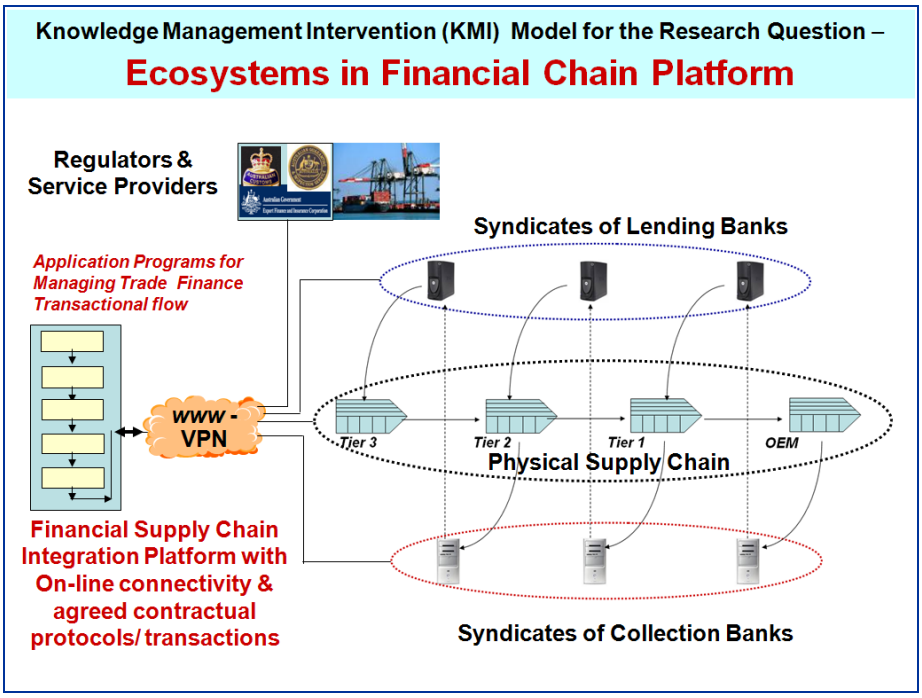

Figure 2.16 – Digital Business Ecosystem are combinations of function – specific group and interests.

The challenge in this case is the Kogan On-line retailer, whose business model largely involves the aggregation of orders received on the Web, and then maximizing direct delivery from their warehouses or the warehouses of the OEM suppliers, directly to the On-line purchasing customers. While issues of local taxes are of significane in determining the competitive postioning of Harvey Norman Vs Kogan, the kwy strategic lesson involves the development of innovative strategies and systems that addresses the specific PEST forces and the specific Supply and Demand factors embedded within the "value Propositions" being exchanged, transacted or fulfilled. Again the strategic supremacy of the "midset" of the ecosystem's membership is evident. This is the factor and the key lesson that SME strategy-making must address.

The Credit Card industry (later illustrated in Figure 2.12) provides a further example of the need for the successful interpretation and management of the mindsets of all the members within the concept of the specific business ecosystem. On the surface, the key issues arrears to be that the Visa organization for combines the strategy-making concepts of multi-sided markets and mass customization approaches with real-time technological support together with fincnaical underpinned by the banking system. This represents the Pre-2000 approach or explanation that most observers accept. SMEs however need to investigate in more detail and depth the strategic management of "mindsets" of Visa's business ecosystem members.

Deconstructing Customer Relationship Management:

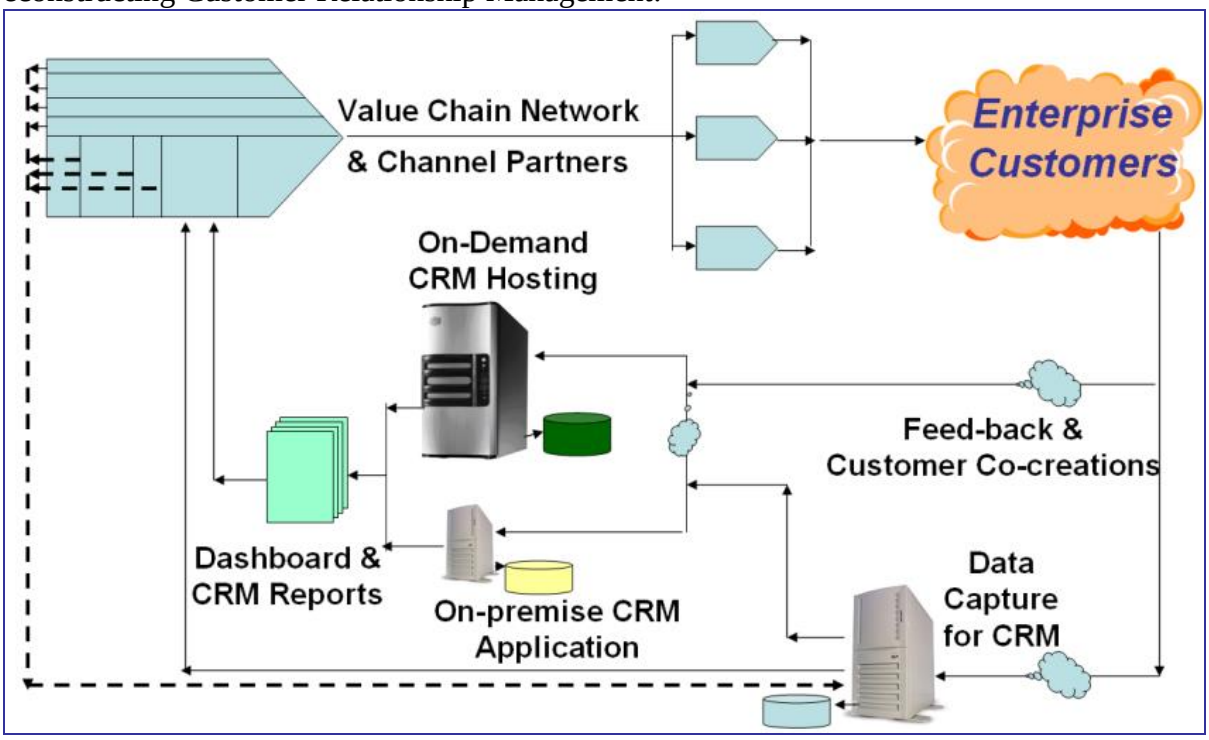

Figure 2.17 – Deconstructing the concept of Customer Relationship Management (CRM) with Value Chain perspective.

The epistemic supremacy of the management of the "mindsets" of business eciosystem members is more easily appreciated within strategies for Customer Relationship Management. In Figure 2.17, the key factor is the interpretations of the expectations and the downstream propensities for action by customers and related stakeholders. This is represented by the"cloud" symbol in the top right corner. While the technologies of servers, databases and transaction records and inducements are important for strategy making – thekey issue is what are the "mind-set" issues these technologies will need to deliver. Brynjolfsson nad McAfee (2007) of the MIT Sloan School of Management have confirmed that it is the new knowledge of separating the technologies from the issues addressing the ",ind-sets" that are the Future of the Web.

2.3.10 New Growth Theory and the "FRAME" for Strategy-making

Professor Paul Romer (1999 and 2002) has developed a generative model that explains how new Business Models can deliver increased returns as the natural outcome of his New Growth Theory. The key ideas and outcomes result from the Post-2000 era's of combinations of science, markets and entrepreneurship. The key idea is that more can be generated from less as a result of the applications of mind-sets' for the generation of varied interpretations, assessments, framing and perspectives on applying, re-using, sysnthesizing and transforming key "fundamental concepts" or "ideas" from science and nature. Full Post-2000 type economic systems can be developed around ideas with the New Growth Theory and its offering of "FRAMES" for strategy development and collaborative implementation

As a result, a Knowledge-based Ecosystem Model can give expression to Romer's New Growth Theory (NGT). and its offer of generating increasing not diminishing returns with greater use of a resouce. NGT systems leverage the power of ideas generated from the mind-sets of technical,

engineering, economic, or social invetors or entrepreneurs. The New Growth Theory system has to focus on the implementation of those new ideas using technology as the platform. The development, evaluation, and application of the ideas and its combination with technology are underpinned by the knowledge perspectives, being offered in the Knowledge Ecosystem Development Model.

The Knowledge Ecosystem Development Growth Model offers two phases – Phase 1 is the setting for the development of idea generating concepts. Phase II involves the implementation of the idea generating concepts by an ecosystem of SME-established organizations that make up commercial markets for trading and value addition of the ideas..

New Growth Theory if anything offers the Knowledge Ecosystem Growth Development Model a "frame" that alerts the ecosystem to the under-utilized power of mindsets to mold their discussions, create new perspectives, develop strategies, and agree on implementation. Warsh (2007), in his book "Knowledge and the Wealth of Nations: AStory of Economic Discovery" , bases his assertions on eGID and the Post-2000 global business landscape on Romer NGT and its "underground river of increasing returns". 2008 Nobel Laureate Professor Paul Krugman (2007) confirms how the lessons from Romer offer potential to assist SMEs recognize the power of mobilizing the mind-set of stakeholders.

Warsh and Krugman explain how the great contradiction of conventional economics (from 1776, the year in which Adam Smith published his "The Wealth of Nations." The eGID concept presented in this Thesis is defined by Warsh as a market economy that can harness self-interest and mindsets for the common good

The lessons for SMEs are indeed bundled within complex discussions embedded with macro-economic theories on trade, globalization and competitive advantage between nations. It is in this context that Table 2.1 has been developed to present SMEs with ideas and frames that can be more easily utilized for strategy-making.

Table 2.1 Strategy-making Frame potential with New Growth Theory

Romer 1990 – Concepts of New Growth Theory	Application of NGT to Digital Ecosystems
Growth is driven by technological change that arises from international investment decisions made by profit maximization agents.	SME growth can be achieved within ecosystems that focus on the technologies (of digitization and the internet) arising from global investor (stakeholders who are important members of the required ecosystem), with a profit maximization (using knowledge-derived insights and perspectives that focus on global markets, sustainable business opportunities and commercial structures)
Stock of human capital determines the rate of growth	SMEs within the ecosystem need the assistance of a Mediated Learning Experience, to interpret the knowledge-based insights, perspectives and

	opportunities – achievable through the Knowledge Ecosystem model
Integration into world markets will increase growth rates, because just having a large home population is insufficient to generate growth	Opportunities and processes for their capture are the design objectives underpinning the knowledge interpretation segment of the of the Knowledge Ecosystem Model
Raw materials have not changed, but the ideas with which we make use of them have changed – Iron marticles now used in magnetic devices for computers and electronic consumer goods (e.g. VCRs using magnetic tape)	Digital technologies are transforming and enhancing the scale, scope, and value of products that are integrated with or embedded within new knowledge systems
Technological change, involving the new uses of raw materials, is at the heart of economic growth	New commercial structures and systems extract the value of technologies
Technological change and capital accumulation account for much of the increase in outputs being achieved	The managed convergence of knowledge and its sharing amongst the members of the ecosystem are designed to achieve the generic combination of capital and technology
Market incentives are responsible for the growth attributed to technological change	New commercial structures proposed by "investor community" members of the ecosystem are the very purpose of their participation in the ecosystem. Their market-sensitive knowledge base is expected to guide the development and growth of the ecosystem.
New knowledge has to be translated into goods of practical value	The commercial focus with profit maximization is the catalyst for value adding the converged knowledge-base of the ecosystem
Instructions for working with new raw materials are equivalent to accessing underground rivers for the ideas that flow within them	The harvesting of mindsets that are based on and generate from the existence of firm foundations within science, technology, marketable transactions and ownership protection systems.

2.3.11 McKinsey's 7-S Model for Strategy making

Waterman, Peters, and Phillips 1980 presented their 7-S model to large multi-nationals in their attempt to assist industry bring together and make more manageable the wide scope and coverage of the available academic models. The knowledge and experience of the leading Management Consultants in the world felt the need to integrate the accumulated knowledge-base. McKinsey's clients were provided with the 7-key directions or perspectives needed to strategize and organize their resources.

Table 2.2 Summary of McKinsey's 7-S Model for Strategy-making by MNCs

Business Model requirements	*Strategic focus in the 7-S Model*
Strategy making capacity	Provide direction, alignment of resources, Resource Mobilization, Long term goals
Structure	Differentiation, Organizational Framework, Departments, Reporting Systems, Expertise areas & Responsibilities
Systems	Specific processes, Formal and informal activity groups of the Porter Value Chain
Staff	Organizational Culture, Human Resources Management
Style	Culture and Behavior and Leadership
Skills	Capabilities and Competencies
Super-ordinate Goals	Innovative thinking

Of importance in the consideration of the McKinsey Model for strategy-making is the fact that an associated support service for the Model's implementation is generally required. Without attributing motives, it is logical to conclude that the Model as presented is but the epistemic tip of the proverbial iceberg and that successful implementation is conditional upon the existence of a substantial intellectual infrastructure. A blind-spot in any of the sub-compoents of the 7 S systems could make the difference of a successful global campaign or a disterous folding of the business. Layers of practical and conceptual issues separate the Model's theories from its prqctical implementation and feed-back as to its effectiveness. The need for and the role of relevant and integrating mindsets makes it further difficult for SMEs to consider it as a ready-to-use system for strategy-making, despite its epistemic pedigree and success stories in some of the worlds largest businesses..

2.3.12 Integrated Strategies recommended for MNC

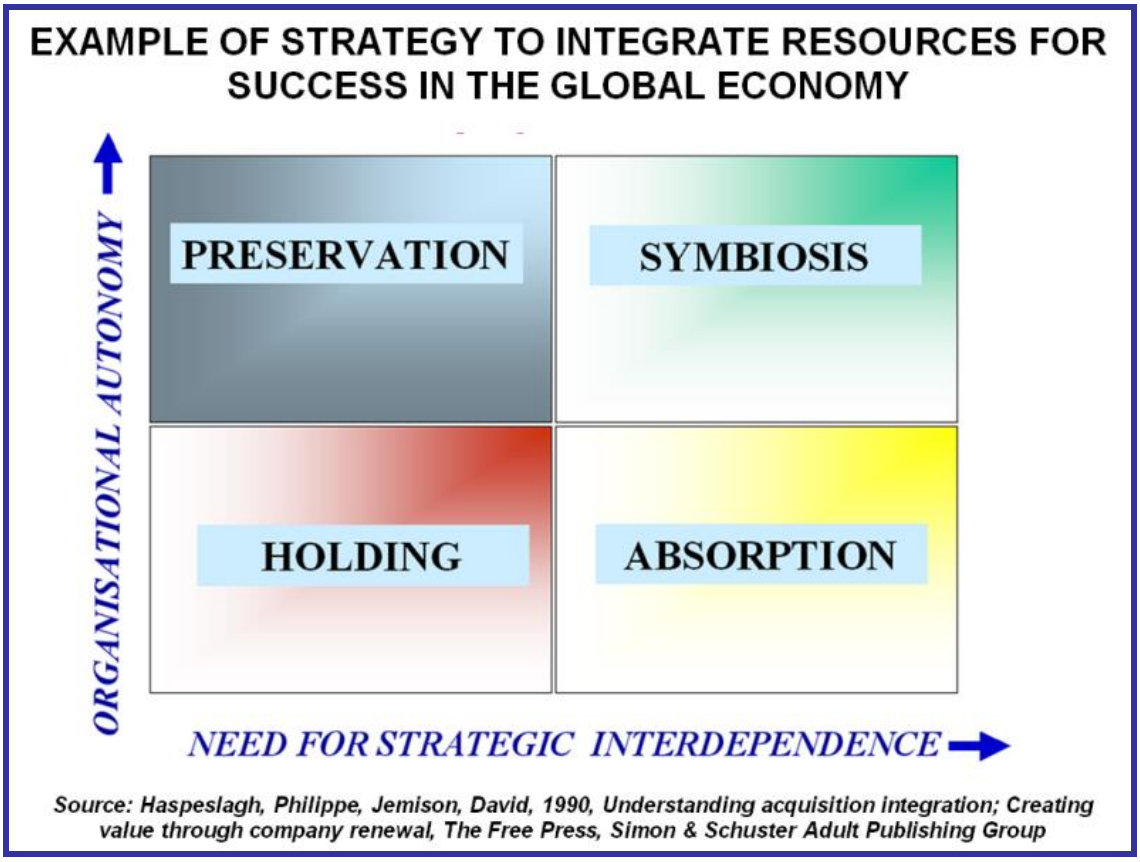

Figure 2.18 – Strategy-making lessons from symbioses in business ecosystems

Figure 2.18 illustrates the types of generic strategies amd recommendations from research and studies that are largely developed for Multi-National Corporations (MNCs). The researchers have conceptualized 4 strategies in the context of how MNC firms should manage mergers and acquisitions (M&As) which in itself is a strategy that most MNCs utilize for non-organic growth of the business. The strategy recommendations are mapped on a grid which recognizes the importance of the need for autonomy and interdependence. Each of the 4 quadrants represents a strategy with a variation in the degree of dependence or autonomy. While the strategy has largely been developed in the context of the MNC, it does offer valuable insights for SMEs who need to combine their resources with other SMEs or MNC, in order to advance the interests of the SME. Underpinning any successful deployment of such strategies is the need for the merging and integration of mindsets within the different resulting structures.

2.3.13 Resource-based Strategy

A further body of Pre-2000 strategy-making models are linked to "resource-based strategic thinking", with a focus on matching strategies to resource availability. Included in the framework is the need for an associated or parallel stratey to obtain funding and resources for the mobilization and establishment of the strategic systems required for delivery and fulfillment of

the planned innovation chains. With Multi-national firms this approach is quite valid and obvious because resources from the corporate divisions need to be negotiated, mobilized and shared in the form of pre-planned budget. Medium and long term capital works need to be established and responsibilities assigned – so that the innovation programs can be implemented in a structured and unified manner across the enterprise.

Collis and Montgomery (2008) have argued that "Competing on Resources" should be the key determining factor that firms must address in their strategy-making challenges. The importance of resource-based strategies is reflected in the umbrella term academics use of the concept of "the resource-based view of the firm (RBV)". The RBV combines the phenomena of internal analysis with the external analysis of the industry partners that need to be recruited in order to manage the competitive environment. Thus the resource-based view has been utilized to explain in managerial terms:

- why some competitors are more profitable than others,
- how to meta-manage the issue of core competence in actual practice, and
- how to develop diversification strategies

The RBV argues that "companies as very different collections of physical and intangible assets and capabilities. No two companies are alike because no two companies have had the same set of experiences, acquired the same assets and skills, or built the same organizational cultures. These assets and capabilities determine how efficiently and effectively a company performs its functional activities. Following this logic, a company will be positioned to succeed if it has the best and most appropriate stocks of ***resources*** for its business and strategy".

Collis and Montgomery (2008) have also argued that the success of the Walt Disney Company can be traced to its RBV-based management of a unique consumer franchise that makes Disney a success in a slew of businesses, from soft toys to theme parks to videos. Similarly, Sharp's knowledge of flat-panel display technology has enabled it to dominate the $7 billion worldwide liquid crystal display (LCD) business.

The RBV discipline and lessons for SME strategy-making extend beyond simple procurement of resources. The mobilization and implementation of the RBV requires the support of new organizational capabilities that need to be "embedded in a company's routines, processes, and culture…" These capabilities need to be built up over time, to transform otherwise pedestrian or commodity inputs and approaches into superior products for the global market.

Collis and Montgomery (2008) also argue that the successes of the UK retailer Marks and Spencer can be traced to their management of the RBV that enables their company to perform activities better or more cheaply than competitors. Acceptance of this strategy-making concept must be accompanied by a capacity to manage corporate resources and functions such as corporate research and development, short and long term assets, brand identity and most importantly the resources available in the minds of its employees and those of their partners and suppliers.

2.3.14 Academic intervention and the metamorphosis of strategy-making models

The advent and popularity of the Master of Business Administration (MBA) course by business schools around the world have made a specific and significant contribution to the 100-year $1 Trillion portfolio of strategy-making models and building blocks. In fact most of the concepts and items listed earlier form the bais for subjects in Corporate Strategy, Marketing, Financial Management, Consumer Behavior and the new emphasis on Sustainability and Lean manufacturing / Six Sigma, etc..

Professor Mintzberg (2004, and 2005) has presented a framework in which the range of strategy-making perspectives can be summarized in the Table 2.3 below. The Strategy-making objectives and building blocks have taken distinctive characteristics based on these different framing concepts that have been presented by academia over the past 4 decades.

Table 2.3 – The metamorphosis of Business Strategy-making and its emergence into Post-2000 mode of global business.

1 The Enterprise-design focus of strategy-making	The original view sees "enterprise-focussed" strategy formation as achieving the essential "strategic fit" between internal strengths and weaknesses and external threats and opportunities (SWOT analysis). Management are expected to formulate clear and simple strategies in a deliberate process of conscious thought. Everyone needs to be aware of the limitations of the enterprise and can implement the strategies. This was the dominant view of the strategy process, at least into the 1970's, and, some might argue, to the present day, given its implicit influence on most teaching and practice.
2 The Planning focus of the enterprise and strategy-making	The planning school grew in parallel with the enterprise-design school focus and continues to be an important influence today. In the planning school focus, the organization reflects on the challenges for strategy-making and develops expertise and knowledge for the deployment of formal implementation stages, each supported and delineated by checklists, focussed on the achievement of staged objectives, budgets, programs, and operational outcomes. Mintzberg (2004 & 2005) has argued that staff planners replace senior managers, as the de facto producers of strategy and their implementation.
3 The Strategic Positioning of the enterprise	According to Mintzberg, the third of the prescriptive schoolswas the dominant view of strategy formation in the 1980's. It was given impetus especially by Harvard professor Michael Porter in 1980,

	following earlier work on strategic positioning in academe and in consulting (by the Boston Consulting Group and the PIMS project). Earlier studies in military strategy dating back to ancient China and Sun-tzu's "The Art of War" have presented academia with an intellectual base on which teaching courses and content could attract and retain the attention of students of strategy. Mintzberg argues that strategy making with this perspective reduces to generic positioning inside the different "business models" that have been presented earlier in this Chapter. With the focus on formalised analyses of industry situations, planners in the earlier "school" give way to integrated analyst-planners. The focus on strategy-making shifts to the requirement of obtaining detailed industry reports and to detailed analysis of the PESTE forces. Industry reports and growth projections form the basis for strategy-making – in a very reactive mode for strategy-making. Strategy-making in this school required the enterprise to analyse and position itself with the assistance of strategic alliances, value chains, game theory-based predictions of how the industrial landscape is progressing.
4 The Entrepreneurship-focus for strategy-making within the enterprise	Academia's intervention in this group focused on the strategic role of key persons in the enterprise – who possess an entrepreneurial mindset. In this mode, strategy-making is directed by the entrepreneurial leader, who decides to take the risks and break free from the earlier models of "two-steps forward and On-step" back. The leaders in this strategy-making school are assumed to also possess good motivating skills and good resource mobiliztion skills – that reach across from Board level to enterprise partners, institutional investors, and implementing teams. This high-risk version of strategy-making is characterized by strategies developed from "the mysteries of intuition", vague visions, and ideas applied to start-ups, niche players, privately owned companies and "turnaround" situations". Academia have strongly linked this model and approach as a key requirement for innovation generation and argued that every organisation needs the entrepreneurial discernment of a visionary leader.
5 The Cognitive of the enterprise – getting closer to the Knowledge-based view of the firm	In the 1990s, Academia commenced recognition of the resources embedded within their staff members, as the source or origin for strategy making. In this school of strategy-making the minds of people contain the required frames, models, or maps to succeed with the mental processes of strategy-making. Mintzberg argues that this mode continues today and that its research has grown steadily on cognitive biases in strategy making and on cognition as information processing. ASlso a newer branch of this school focuses on the

	generation of interpretative or constructivist views for the strategy-making process. Cognition is recognized as the key determinant to construct strategies based on creative interpretation of the business landscape and the generation of response-strategies.
6 The Learning enterprise	Academia's focus on learning extends beyond the natural linkages between scholarship and the educational system. Strategy-making in the learning school mode became a veritable wave challenging past approaches to strategy-making. Strategy-making with the benefit of a "learning perspective" incorporates its own portfolio of sub-concepts such as "incrementalism", (the notion of a series of nibbles rather than one big bite), staged "venturing", "emergent strategy", (progressively growing out of earlier decisions and experiences) and "retrospective sense making". The model of strategy making as a learning-activity sought answers from the education and training industry sectors – that will be explained further with the concepts of Double-loop learning, the Fifth Discipline, and "The Learning Organization" of Professor Peter Senge.
7 The Power of the enterprise	Mintzber argues that this mode or corporate environment for strategy-making is rooted in corporate political power, involving awareness building exercises, team building, bargaining, persuasion, and confrontation among the strategy-making actors and decision makers. "Macro power" extension of this approach involve strategy-making that engages partners in alliances, joint ventures, and other network relationships to negotiate "collective" strategies for joint and collaborative action in markets that may be too large for the single enterprise.
8 The Cultural of the enterprise as the bed-rock and leverage system for strategy-making	In a further move towards the ultimate source of strategy-making insights and concept development, this school focuses on using and leveraging the culture of the firm. Self interest and fragmentation by individuals are managed by the power of the culture maintained and grown within the enterprise and its management. Strategy formation as a social process is rooted in the firm's culture – especially in the context of strategy making involving risk taking, commitment to growth, strength of competitive response, speed of response. Again strategy-making is highly dependent on leadership and the demonstrated commitment to the firm's published and acknowledged culture – in some cases even to the firm's disadvantage when a culture discourages risk taking and significant strategic change for innovation development. In Miontzberg's view "Culture" has become a big issue in the American literature after the impact of innovations introduced by Japanese manufacturers and after failed attempts at simplistic mimicking of their strategy-making concepts. The key requirement with this mode of strategy-

	making is that product-imitation must be accompanied by "difficult-to-imitate" cultural factors.
9 The Environment of the enterprise – involving both the physical and the business environment – ass the frame for strategy-making	In this mode of strategy-making, the physical and business environment and the business landscape are the framework for conceptualizing concepts for innovation, competition, and business growth. Mintzberg argues that strategic management is forced to "use their degrees of freedom" to create strategy, develop "contingency theory" and add the new dimension of "population ecology" as part of their strategy-making choice.
10 The Configuration *of the enterprise – as part of the concept of a "Business Ecosystem" of interdependent entities interacting for mutual and common benefit*	In this mode academia sees organisational development and strategic growth as a challenge involving enterprise configuration within a global business ecosystem. Mintzberg argues that strategy-making must address the formation of coherent clusters of characteristics and coordinated behaviours. Interdependencies and mutual support and collaborative growth – must take the place of narrow self-interest in this mode of strategy-making

2.3 Technology Enabled Business Strategies

Noted Emeritus Professor Robert Solow and 1987 Nobel Laureatehas provided the framework for SME strategy-making to give consideration to technology enabled strategy-making. It is based on his research findings that approximately 80% of productivity gains in the US GDP can be attributed to technology-enabled business growth and productivity. The 1980s for example has been deemed to be the "IT era" with computers, digital electronics, database system technologies and digital communications systems establishing their power and preference to analogue systems. With insights generated from over 60 years of high level macro-economic engagement, Solow has acknowledged that the greatest contribution from technology is evident in Joseph Schumpeterian theories of creative destruction. The power of digitization results from the permutations from the combinations and permutations of the binary – the 0 and 1 digits in waves of creative destruction, Each successive development in managing the digital frames simply leapfrogs the earlier capabilities and presents a further range of opportunities for innovation. For example software that originally limited itself to 8 bits is now represented in 1028 bit algorithms, communication packets, data representations, voice and viderecordings,etc.

SMEs are aware of the transforming nature of Digital information technologies and their catalytic potential that can facilitate stretegies for new product and new services development in modular and platform designs – with the availability of CAD, CAM, CAE, and FEA (Finite Element Analysis), etc. .

In true Schumpeterian prediction, innovation development has benefitted from the technology waves for 3-D digital printing and SLS rapid prototyping technologies, etc. They can generate prototype representations of new concepts, ideas, products and modules using Nylon, Glass – filled Nylon, Polystyrene and Alumide (to mimic the metal-like finish).

ThePost-2000 concept of "Additive Manufacturing" is of direct relevance to SME strategy-making consideration and firms such as 3T RPD (at www.3tpd.co.uk) manufacturer of some of the largest Selective Layer Sintering Machines in the world. At the opposite end of the technology spectrum, the firm MakerBot (at www.makerbot.com) produces relatively low cost 3-D printing that would be in the easy reach of SMEs. In the sections that follow, a brief outline is preented of the potential for establishing SME mindsets to capture the offerings from technology-enabled strategy-making.

2.3.1 Digitization – Digital Business Ecosystems

The value of Digital and related technologies for SME strategy-making extends beyond the individual component manufacturing technologies or innovations embedded within new product development. Rather its value resides in the progressive waves of transformation and aggregation and enhancement of existindigital and analogue services or products. In addition their value adding results from SMEs working in unison with web-enabled supply chain partners or business ecosystem members.
In Figure 2.19 for example, it is clear that from an SME perspective, the future benefits from Schumpeterian Creative Destruction can be gained from the systematic structuring and in utilizing the portfolio of digital technologies. These need to be considered as part of a progressive spectrum of technological capabilities and opportunities that need to be progressively harvested rather than adopting a static approcah to advance long-life technological hardware. As illustrated in Figure 2.19, the concept of progressive waves of opportunities need to be considered for with each of the transient phases. Each new life-cyle of a date-sensitive new technologies disrupts existing physical systems for only a short while before itself suffering the same fate.

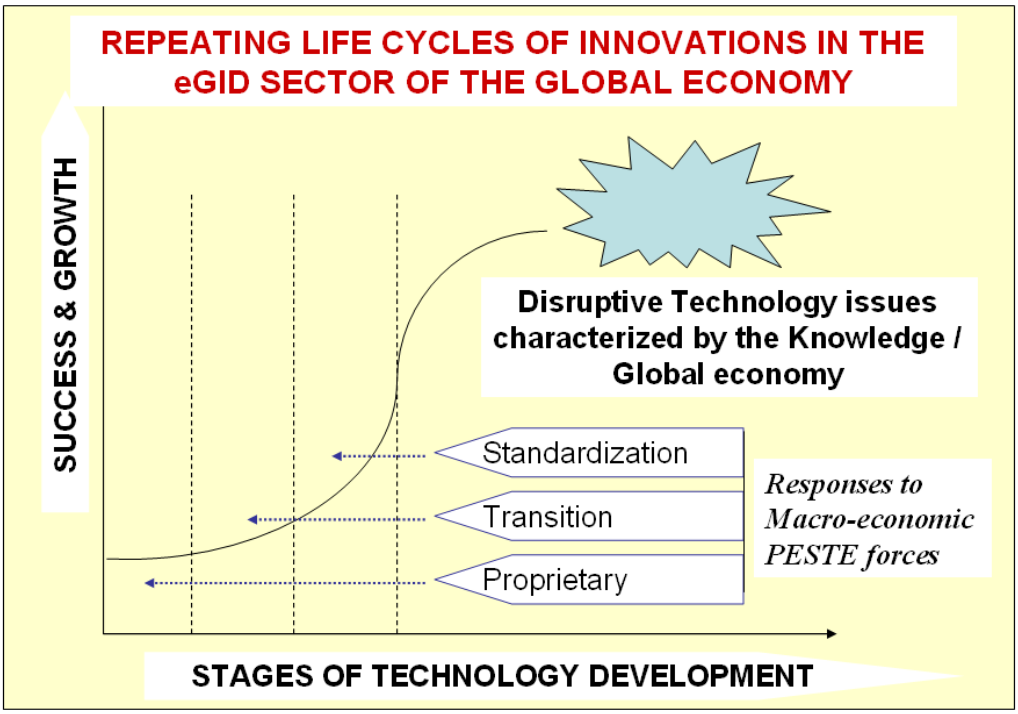

Figure 2.19 - Drivers of the "disruptive" innovation that characterizes the global economy

And in the process new levels of functionality and capabilities are delivered on a scale that had never been achieved before. The implications for Gordon Moore's Law on technological development offers a definite frame for SME streagy-making.

Additionally research by Harvard University Professor Christensen confirms the need for a new type of strategic discipline that should focus on digital business ecosystems. As a group they can better absorb the transient nature and dynamics changes of technology. They can also leverage and enhance the technological gains in orders of multitude greater than when the individual components or entities are working alone. Digital technologies can be leveraged even further when the ecosystem makes greater use of web-browser software and internet connectivity.

Digital representations of physical, sensing, thermodynamic, mechanical and conditions are state are ubiquitously represented by a collection of 0s and 1s in sequences and packets, that are progressively built up.

Commencing with transducers that convert the physical conditions of state into digital signals, the continued aggregations takes place with other systems that are then further integrated to produce what we now take for granted, viz:

- Digital music
- Digital Cameras and Digital Videos
- Digital communication
- Digital clocks
- Digital text to speech transformations
- Digital optical character reading, etc.

In fact there is no limitation to the process by which almost all human artefacts and activities cannot be represented in a digital format, to then be then standardardized through global

communities, which are then followed by the manufacture of hardware and the development of software.

The cycle of exponential growth of digital system technologies is characterized by the doubling of knowledge that takes place every year. The key issue however is that the innovations result from the combinations of just two conditions of state 0, and 1. This is an issue of profound importance because it confirms the basic mechanism by which innovations and new product developments are obtained – ie by the systematic re-arrangment of concepts and systems that can e eventually reduced to such conditions of information-states.

2.3.2 RFID and Web-based identification systems

The leveraging of technologies beyond the individual value of digital equipment or products is exemplified by the technology known as EFID – or Radia Frequency Identification. Essentially it is an extended electronic version of the printed bar-code system. Numerous difference exist however in that the RFID tag can contain significantly greater amounts of details on the manufacturer of the product, its dates, source, handling instructions, the validity factors, etc. In addition, the data can be accessed wirelessly and from distance up to 5 metres.

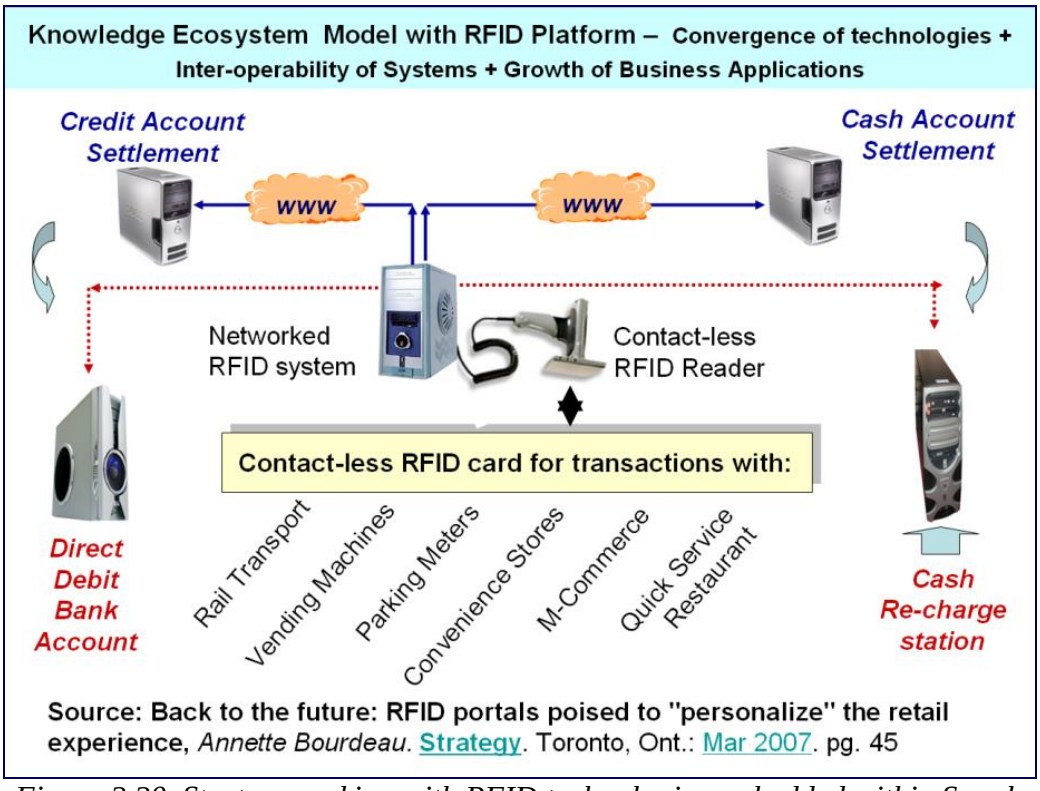

Figure 2.20 Strategy-making with RFID technologies embedded within Supply Chain pipelines

Figure 2.20 for example demonstrates the power of strategic-leveraging from the introduction of specific digital technologies across the entire business ecosystem. The lower-centre section of the diagram lists the stages through which a manufactured product must evolve from the OEM manufacturing facility to the retail outlet, through varying transportation modes. At each of these transport nodes or interchanges, the RFID tag fitted to the product would be scanned and

its time-date-location details uploaded to the dedicated on-line servers – as illustrated in the upper centre of the diagram. The RFID enhanced business ecosystem would also include financial entities who would release funding depending on the contractual obligations. For example, logistics service providers would receive payment, once the RFID fitted item is received at the warehouse or Distribution Centre and its presence within is confirmed by the uploaded information received by the Server.

Such integrated ecosystem arrangements and embedded technologies would allow SME organized business ecosystems to gather unprecedented detail about where their goods come from and how they progress through the supply chain. The information can be used to improve product quality and safety, and to ensure authenticity.

The technologies--which range from miniature radio-frequency ID tags to DNA markers to bar codes--can reveal a wealth of data about a product's provenance and greatly increase the transparency of supply chains.

SME strategy-making could benefit from the fact that consumers and other stakeholders want to know more and more about products – from the instant that a purchase order is provided. It is argued that SMEs must open their information-base on goods within their supply chain pipeline if they are to succeed in the global business landscape.

2.3.3 MEMS – Micro-Electro-Mechanical Systems and Nano-scale Systems

Micro-Electro-Mechanical Systems (MEMS) integrate at the micro-level, a range of mechanical elements, sensors, actuators, and electronics on a common hybrid chip to deliver multiple electro-mechanical functions. The hybrid chip is manufactured using micro-machining processes to form "smart" mechanical and electromechanical devices. The smart chips possess computational abilities, with sensing, monitoring, and control capabilities using micro-sensors and micro-actuators.

MEMS devices are embedded within products that can range from medical devices, to automotive parts, and air-conditioning and heating systems. MEMS function as the product's brain using embedded decision-making, ultra-sensitive sensing, control algorithms and actuating and activating mechanisms for physical movement. MEMS sensors monitor their local environments through measured mechanical, thermal, biological, chemical, optical, and magnetic forces that change with the environment being controlled. Collected information can be processed according to the algorithms before releasing or shutting down power to the actuators. The product embedded with the MEMS can then respond with one of its components by moving, positioning, regulating, pumping, and filtering fluid flow, etc that goes through the product.

The relevance to SME strategy-making again extends beyond the intrinsic value of the embedded technologies. SMEs can benefit by learning how to apply the technologies within the analogue devices and processes from the sourcing of feed-stock through to manufacture, distribution, logistics and business ecosystem utilization. The "meta-value" that can be embedded within whole-of-systems needs to be released and SME strategy-making needs to continuously monitor the opportunities for such transformation and value delivery.

A key technology that can be combined with MEMS is the use of ZIGBEE technologies. Nanoscale sensors and actuators can be connected into a Zigbee network where all of the connections are wireless. The whole Zigbee network and its portfolio of sensors can monitor and report on the operating conditions within a system.. Examples can include a Manufacturing Cell (a combination of machines working in tandem to produce a module or component).

SME strategy-making cannot afford to neglect the potential for the combination of MEMS with Zigbee technologies – because they can deliver a range of innovations for the so called "smarts" in smart transport, smart electricity grid, smart entertainment platforms, smart zones in buildings, etc. The two defining criteria for SME strategy-making is the evolving nature of the technology-combinations, the relatively low-cost nature of obtaining information on such systems (for example at engineering@mems-exchange.org), and the integration of these hybrid technology combinations and the delivery of their signals, reports and outputs via the Web with internet connectivity.

ME strategy-making specifically needs to consider the hybridized versions of the Nano-scale System Technologies because of the potential for their applications to relate to the "Local" zones of the Prahalad IR- curve. SMEs could deliver high levels of "local response" as they relate to the IR diagram, in levels that would be of value to MNC and global corporations.

By so doing and obtaining recognition from MNC, SMEs could then propose and enter into strategic alliances and joint development activities for their business growth. SME strategy-making's quest must therefore incorporate both an element of "Technology Inquiry" and "Technology Integration" if they are to develop product-packages and integrated service operation with larger organizations and their business ecosystem membership.

Again early stage awareness and conceptual application examples are available in the public domain for SME consideration. Examples include publications by the Georgia Institute of Technology and their regular publications in www.sciencedaily.com, viz:

(i) Energy harvesting: Nanogenerators grow strong enough to power small conventional electronic devices. *ScienceDaily*.
Retrieved November 11, 2010, from
http://www.sciencedaily.com /releases/2010/11/101108151416.htm

(ii) Self-powered nanosensors: Nanogenerators used to power sensors based on zinc oxide nanowires. *ScienceDaily*. Retrieved November 11, 2010, from
http://www.sciencedaily.com /releases/2010/03/100328170247.htm

(iii) Power Shirt: Nanotechnology In Clothing Could Harvest Energy From Body Movement. *ScienceDaily*. Retrieved November 11, 2010, from
http://www.sciencedaily.com /releases/2008/02/080213133347.htm

2.3.4 Digital Credit Card Systems

The lessons for SME strategy-making on the power of technology integration and hybridization of technologies is best illustrated by the evolving global business of Credit Card Systems. Its successes offer an outstanding example of the effectiveness of digital business ecosystems and the evolving nature of on-going technologies and their almost immediate introduction into the hybridized "business ecosystem" type applications. In both scale and scope, groups of stakeholders converge together with the assistance of digital technologies to ensure the ecosystem grows for mutual benefit. In less than 30 years since its initial deployment, the credit card and its varied derivatives have integrated and impacted on the functions of borrowing, lending, payment, identity, mobility, clarity, interoperability, and visibility. Stakeholders range from the banks and lending bodies to the merchants and the consumers. Hock Dee 2005 the acclaimed banker who assisted in setting up the Visa credit card presents valuable insights into the working of one of the 20th. century's most successful digital business ecosystems.

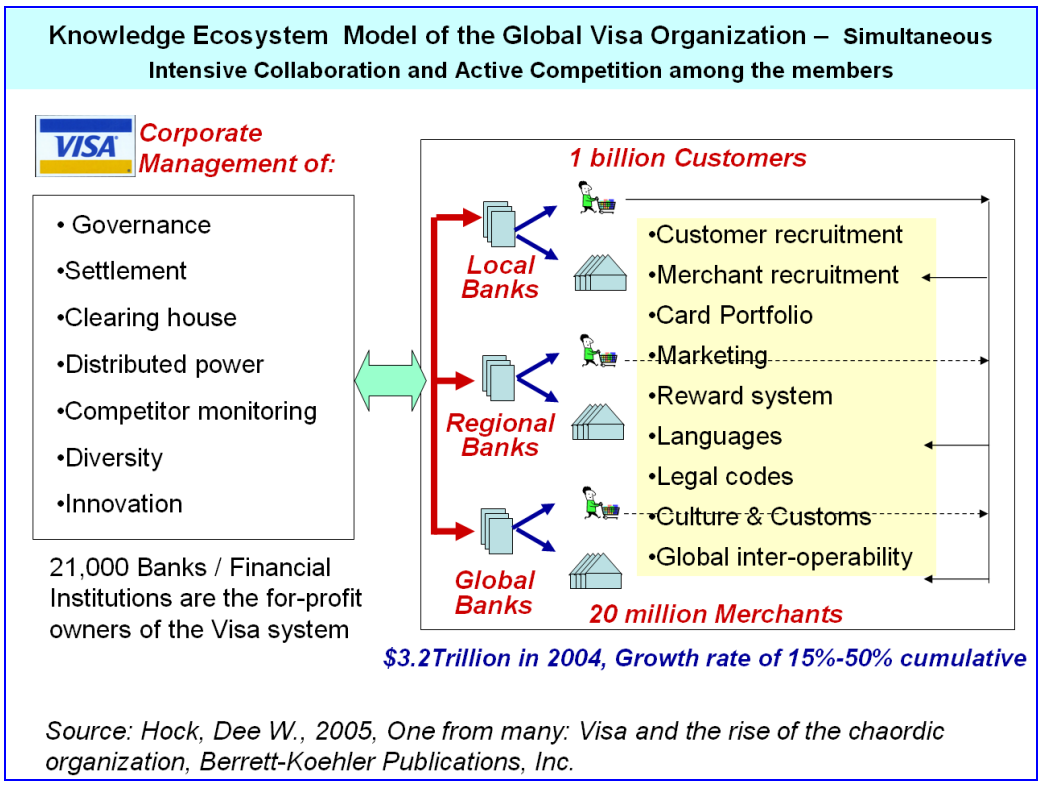

Figure 2.21 – Strategy-making lessons for building Digital Business Ecosystems

Figure 2.21 illustrates the functioning of a digital business ecosystem which utilizes the credit card system as the common platform which unites the service-delivery functions and the fulfillment mechanisms of the different stakeholders. Strategies utilized in the development and operation of the Visa Credit Card system have been extensively documented by Hock Dee 2005. The diagram shows how customers work with local bans and card issuing financial institutions, who in turn work with regional banks and global banks and lending authorities. The entire system is coordinated by a relatively slim Visa enterprise despite the $Trillion-scale of the operation and the high growth rates of card utilization.

The dominant strategy lesson for the SME is that ecosystem as the unit of analysis is a mandatory requirement for strategy-making considerations.

2.3.5 Web2.0 Business Models

SME strategy-making therefore needs to develop a structured approach to achieving awareness, evaluating technologies, and determining methodologies to apply the strategies within business ecosystems. The following illustrations provide examples of the manner in which normal conventional Pre-2000 strategies and business models have been upgraded with Web2.0 technology enhancements.

In Figure 2. 22 for example, a new Web2.0 technology enhancement can deliver a new Service Management model – delivering Credit and Payment recording checking processes and services within minutes, rather than the weeks it would take with the Pre-2000 manual or physical equivalents.

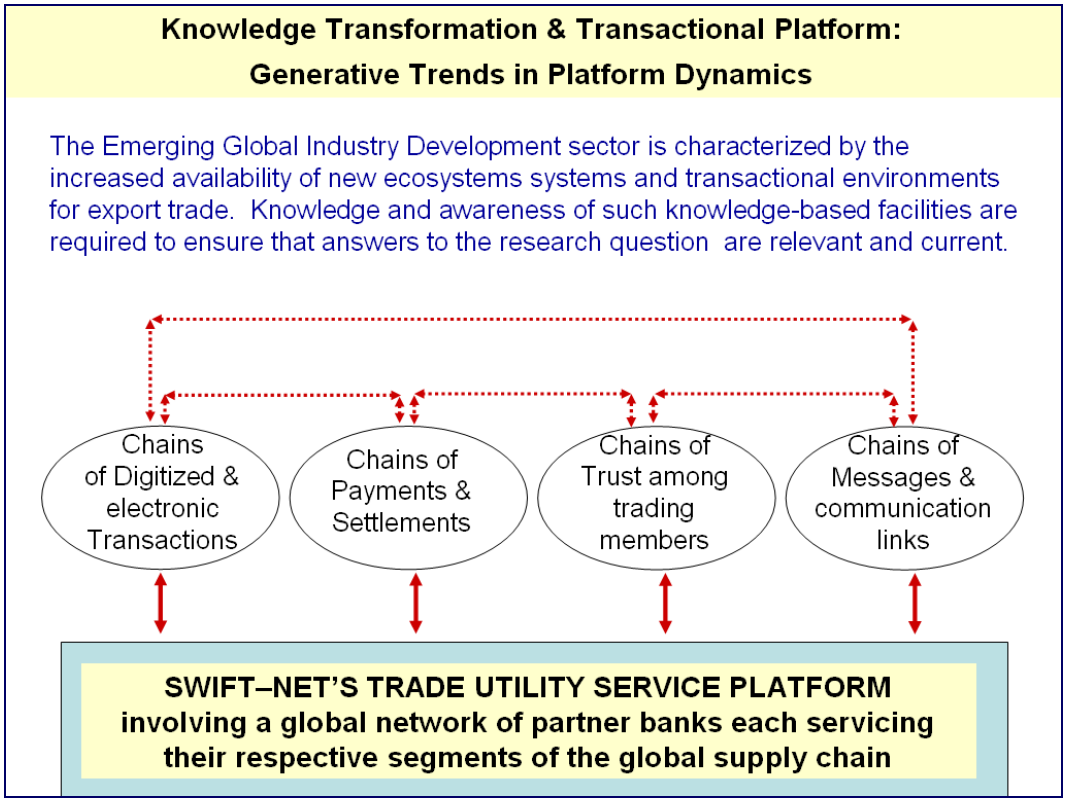

Figure 2.22 – Strategy-making that leverages and adds value to the physical chains of Pre-2000 business groups and activities

It is in the interests of SME strategy-making for a concerted effort to be made to seek out the "chains" or groupings of businesses that would benefit from the common use of digitally delivered business infrastructure. The innovation would involve linking them to On-line Servers that would deliver the manual functions in a highly automated and report detailed manner.

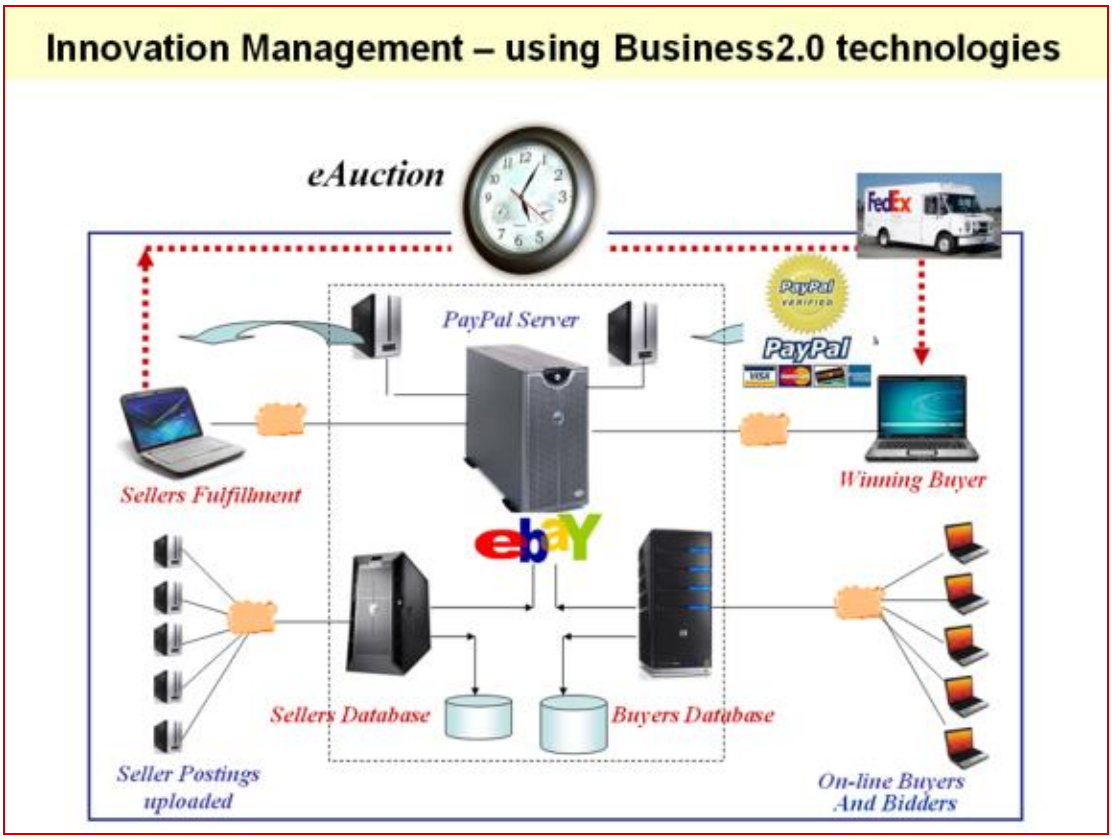

Figure 2.23 – Leveraging the technologies of Web auctions for SME strategy-making

SME's natural landscape on the Prahalad Integration-Response Grid (the I-R diagram) requires consideration of the technologies of Web mediated auctions. Again it is not the physical activity of the auction that underpins its strategic value. It is the nature of the instantaneous, automated, remote, and impartial functionality that can be obtained.

In Figure 2.23 for example, the services delivered by the eBay organization are relatively simple, in the light of knowledge that is now made available in the public domain on internet technologies, on real-time database connectivity, and the use of "smart" algorithms.

The value to SME strategy-making is that these technologies can be adapted and customized to SME ecosystem context with relative ease and speed – as detailed further in the "Innovation" driven strategy section within this Chapter.

2.3.6 Dell Direct Sale Model

SME strategy-making could similarly benefit by critically evaluating the potential for adapting, customizing and leveraging the technologies embedded within the Dell "Direct Sale" model. Figure 2.24 attempts to explain the integration of physical activities that are mediated via the Web to deliver unprecedented levels of saving and benefits to stakeholders and the Dell mediated business ecosystem.

The Dell Model commences with the web-based advertising of specials and offers for customizable PCs and Laptops and other electronic devices and systems. The Cental Server (located in the centre of the diagram) is serviced with web-based connections not only with its internal facilities but also with the entire business ecosystem membership. Once the potential customer makes contact with the Dell site, offers available are presented for the customer to make a choice of equipment type, capacity, functions, accessories, attachments, software, communication system additions, etc. The choice for the customizable selections is made possible in real-time by the on-line database connectivity between the Dell Web client-server and the Master Database that tracks all computer interactions.

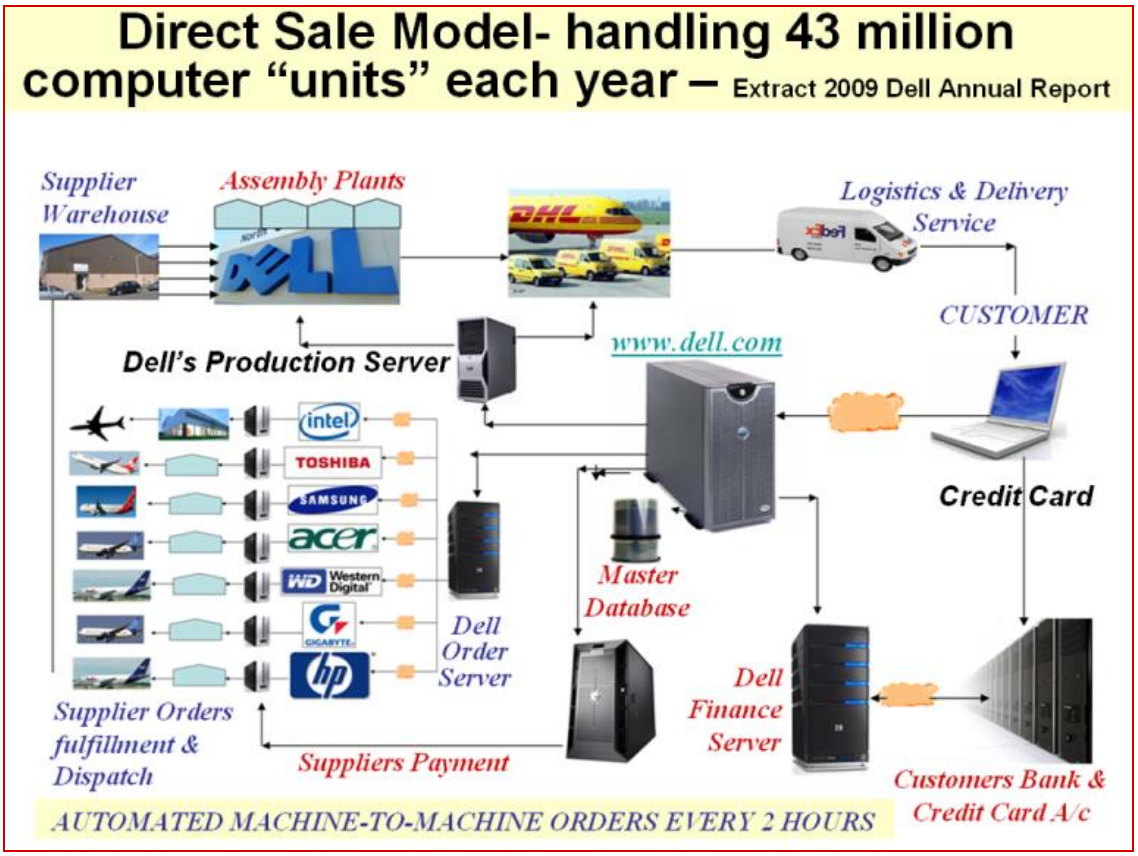

Figure 2.24 – SME strategy-making lessons from the Direct-Sale Model made popular by the Dell Corporation

Once the Customer confirms the purchases, the Central Server then swings into programmed action. Commencing with the confirmation of the order and its parts list, the Customer's credit card details are then routed to the first of a range of specialized Transaction-type servers. The customer is charged with the agreed amount and the Dell Bank account receives the payment. The Client is then provided with receipt and contact details on their order and the automated back-office proceeds with the chain of events – all mediated in computer-ti-computer interactions.

The Central Database for example is queried every 2 hours, and a special "Ripper" program extracts and aggregates all of the "ordered" units for each specific manufacturer who work within Dell's business ecosystem. Dell's target sales of 25 million units each year roughly translates into 5000 units every 2 hours for consideration by the "Ripper" program. Each supplier

is then automatically notified on the portion of that 5000 order slice that they need to fulfill, within 24-48 hours notice. Illustrated on the lower left of the diagram for example, are specialist OEMs such as Intel, Sharp, Toshiba, Samsung, Microsoft, FoxConn, etc., who seek to provide dell with the models for assembly in Dell's Assembly plants strategically located around the world.

The Dell's Central Server-Ripper then updates the suppliers on the order status and the locations where the different components need to be forwarded to. The defining issue is that the updates are near instantaneous and that Dell shares relevant portions of its real-time order-book with its business ecosystem membership for synchronized action. As illustrated in the upper section of the diagram, the supplies from the membership are delivered to Dell's assembly plant. The management of the Assembly plant is similarly provided with advance notification of the required orders for fulfillment. Finally the 3PL (Third Party Logistics provider) forming part of the Dell ecosystem collects and delivers the completed order to the customer.

The lessons for SME strategy-making are not for them to compete with Dell, but to learn to deploy and embed the Web2.0 technologies within SME organized business ecosystems. The technologies required for "Dell-direct-sale" operations are increasingly being commoditized and made available under the Cloud Computing sector and the lessons for SME strategy making includes the need to become familiar with both the business model as well as the underpinning technological platform.

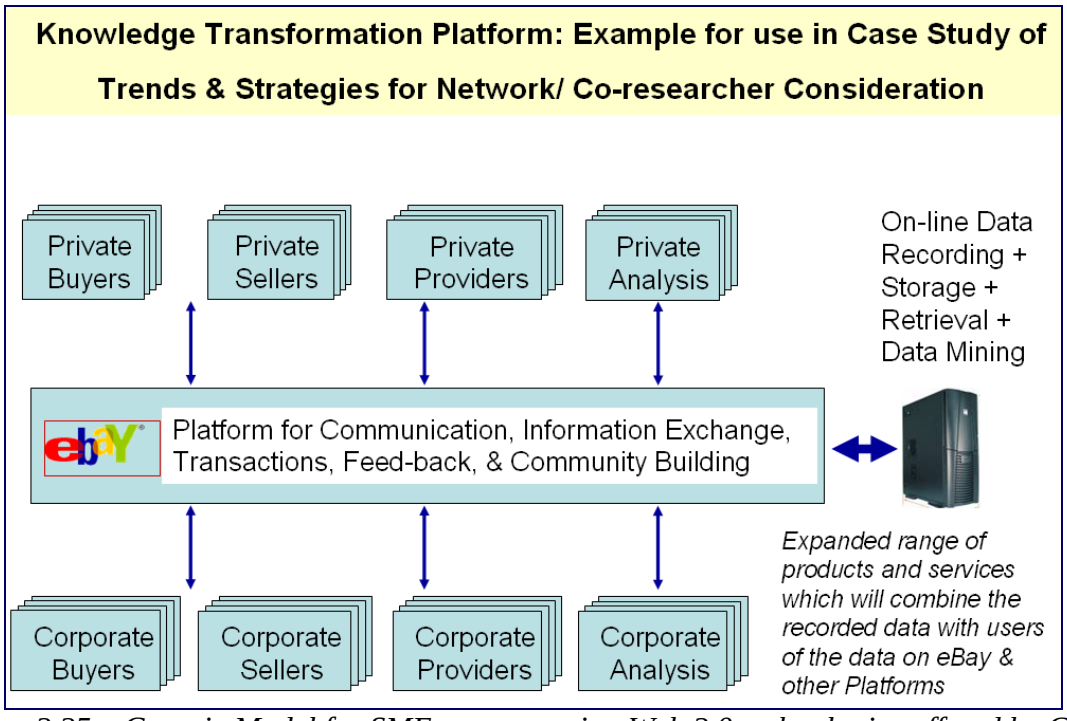

Figure 2.25 – Generic Model for SME strategy using Web 2.0 technologies offered by Cloud Computing platforms.

It is in this context that SME strategy-making needs to conceptualize the concept of Web2.0 technologies and their integration with the physical entities that participate as buyers, sellers, agents, service providers, or financiers.

SMEs for example need to conceptualize their role as the builder of a Trading Platform – with Web connectivity with all stakeholders and business ecosystem members. Each member needs to be characterized on whether they are part of the Supply side or on the demand side or the value adders, as illustrated. The physical functions, interactions, records, reporting, notifications, transactions, and fulfillment actions required by each group needs to be "virtualized" and made available for specialized Cloud Computing infrastructure and application software.

2.3.7 Mass Customization Models

A further strategy-making concept for SME consideration involves the strategy of "mass customization" where-by SMEs would seek to deliver the combined benefits from economies of scale and customer loyalty from customization. This strategy-making concept is of direct relevance to SMEs because of their proximity to local markets and customers, as presented in the Prahalad IR-Grid.

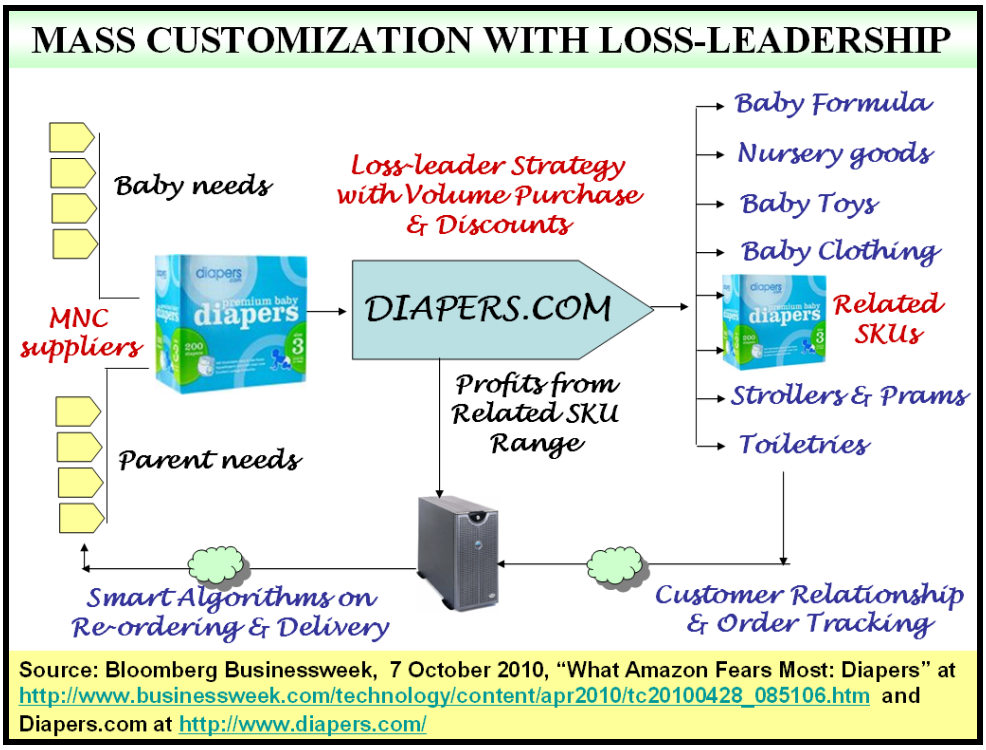

Figure 2.26 – Mass customization strategies for SME innovation and business growth

Once SMEs become confident of Web 2.0 technologies, they will be able to identify sources of mass produced products that are destined for the global markets. Some of these products would be generally available in "no-name' brand versions, or in generic form ready for branding. The SME would need to recognize this potential for "branding" them in the SME-local customer value proposition strategy and then innovate and organize the fulfillment processes.

Figure 2.26 for example illustrates the implementation of the Mass-customization strategy, in which the concept of Customer Value Proposition is central to the delivery and fulfillment of product-services for families with young siblings. In the example provided, the start-up firm www.Diapers.com offers a strategy in which the home delivery of ordered supplies of diapers is

a loss-leader incentive for customers to initially utilize the service. The start-up firm, in its 5th year of business (in 2010) is grossing in excess of $500 million. Its strategy of linking the loss making sale of diapers to the sale of higher-priced related products appears to be well accepted by customers who are offered services that incorporate a number of strategic elements such as a differential price for goods delivered in a time sensitive service, or in a coordinated delivery service, with an optimized logistics approach.

The distinctive element and lessons for SME strategy-making are the linking of highly visible products with the rest of the product sale candidates that relate to the life-stage of families with children in need of diapers. These goods range from those directly used by the babies (like formula foods, clothing, etc), to the parent-lifestyle needs such as strollers and nursery furniture, etc. The loss-leading availability of diapers has obviously developed into strong customer relationships, with customers deciding to avail of the service despite the higher pricing of the related items. The volumes of the loss-leading diapers are sufficiently high (in excess of 100 million each year) for large multi-national firms to assist the start-up with the order fulfillment processes.

2.3.8 Multi-sided e-Markets

The strategy of linking sales between items and using the common leverage and infrastrucutre to suppor the combined sales is specifically of potential value to SME strategy-making. Apart from "Mass Customization" SMEs can benefit by developing a structured approach to the management of its business ecosystems and the potential strategic-alliancing with its membership beyond single business-line concepts.

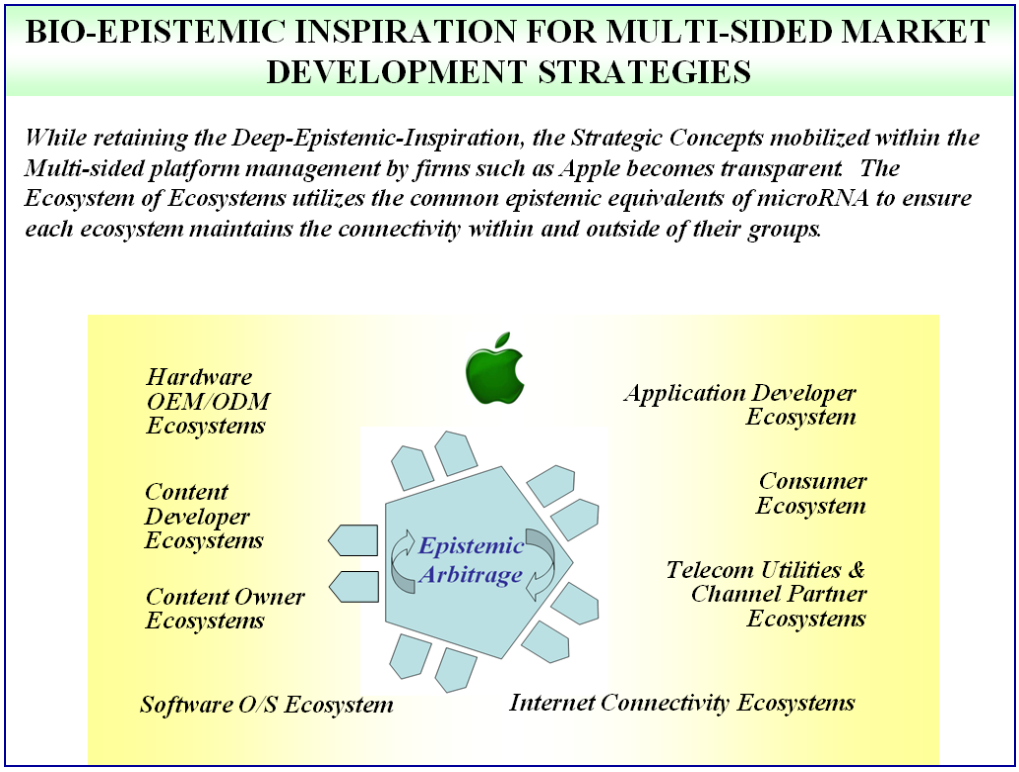

Figure 2.27 – Expanding single business-line operations into multiple business-line operations for SME growth and innovation development.

SMEs must change their mind-set from single-line business operations and utilize the concept of the "Catalyst Code" to bring together a host of adjacent business opportunities and business associates in the business ecosystem, with a focus on innovation and new product development.

For example, Figure 2.27 illustrates how the concept of "Multi-sided Market" strategies (MSM) is leveraged by the Apple Corporation to function with a common platform from which a range of innovations can be commercialized. The elegance of the Apple MSM is the capacity of the firm to access the different business ecosystems of the supply chain and channel partners in order to fulfill global market expectations.

A further example and lesson for *SME* strategy-making is offered by the CISCO corporation. Their corporate objectives are to commoditize their hardware and software innovations for internet infrastructure development and connectivity.

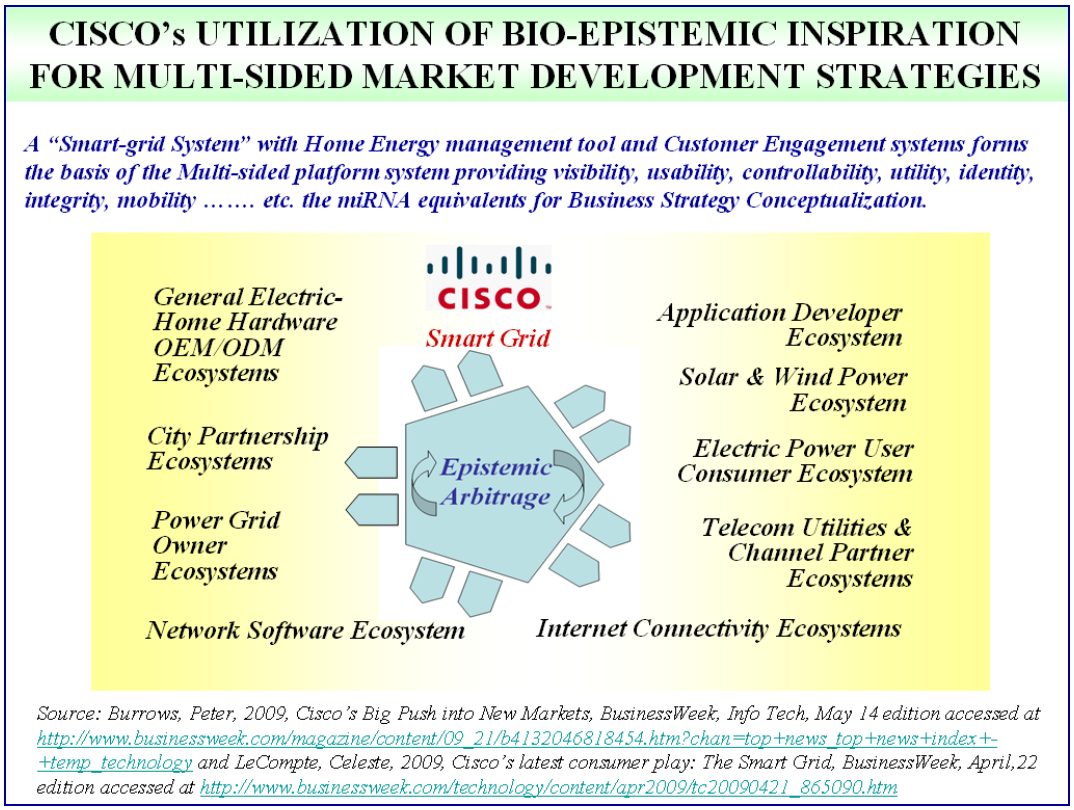

Figure 2.28 – SME lessons and learning from CISCO's strategies for business development and system innovation

SME strategy-making needs to adopt both a meta-level and a sub-ground level review of the CISCO example of using the concept of "Multi-sided" markets. SMEs need to relate their own innovations and new product ideas to a wider context, in the initial stage.

As illustrated SMEs then need to review the core product functionality in the context of their supply chain partners and their business ecosystem membership and their customer-base in addition to the SMEs own customers. SMEs can then start to develop patterns where their core

product could be seen as the core platform that could benefit from enhancements and customizations and value-additions from their partners and ecosystem members.

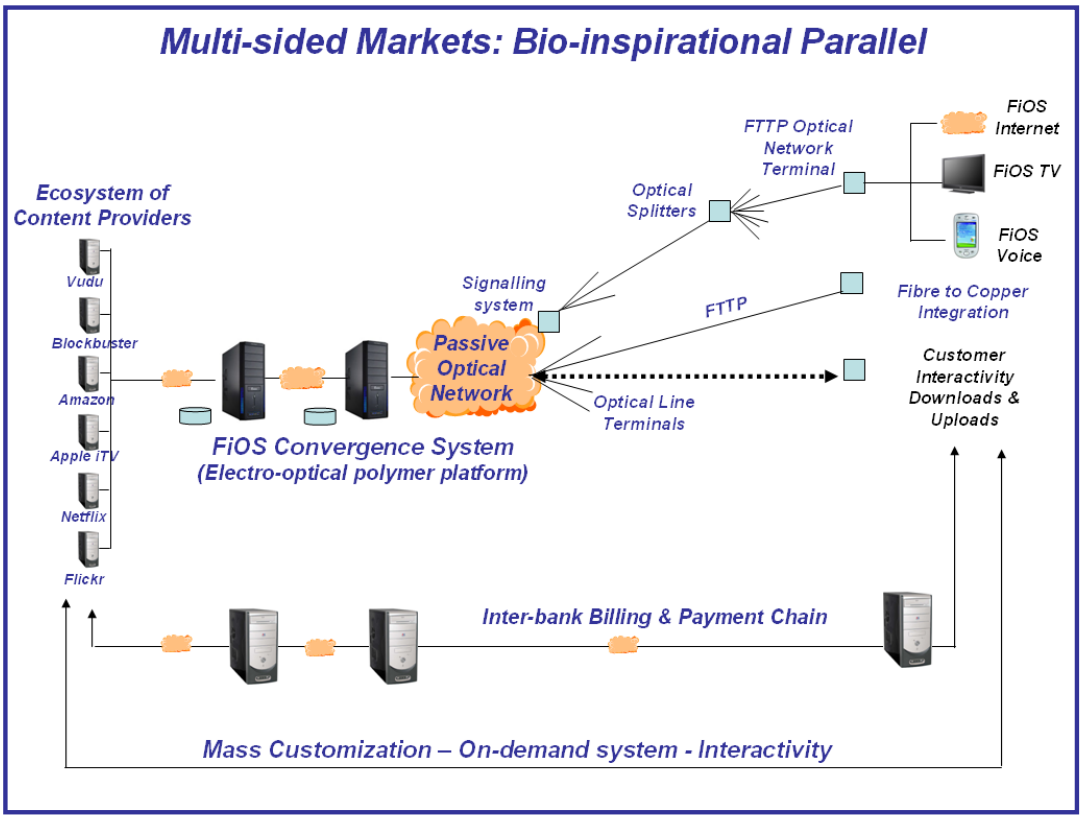

Figure 2.29 – Lessons and learning for SME strategy making from the Fibre Optics industry sector

In similar fashion, SMEs should consider the strategic viewing of business activities taking place around them for opportunity identification and innovative linkages. One segment of the Fibre-optics industry as illustrated in Figure 2.xx can deliver lessons on strategy-making for SME consideration.

In the illustration for example, the typical SME could be strategically positioned either as a miniscule sub-contractor delivering services on charge-out rate involving time-based or unit-based calculations. The strategic option is to utilize the concept of partnering with multi-national corporations who are relatively remote from the communities being serviced. The SME strategy would be for the ecosystem (especially established under this strategy) to provide turn-key services for the multi-national corporation. The strategy-making choice for the SME is between a price-taker and a price-setter.

2.3.9 Globalization 3.0 and 4.0

An expanded and an almost unlimited Strategy-making landscape exists for SMEs who would be willing to embrace and integrate Web technologies, internet connectivity and the creation and management of business ecosystems. The approach does not require abandonment of the core busienss of the SME – in fact it is a strategy for expanding the core business.

As illustreated in Figure 2.30 , the power of the business ecosystem concept can only be realized that in the Post-2000 era firms do not compete with other firms. Actually it is the competion between one ecosystema nd another ecosystem that characterizes Post-2000 business.

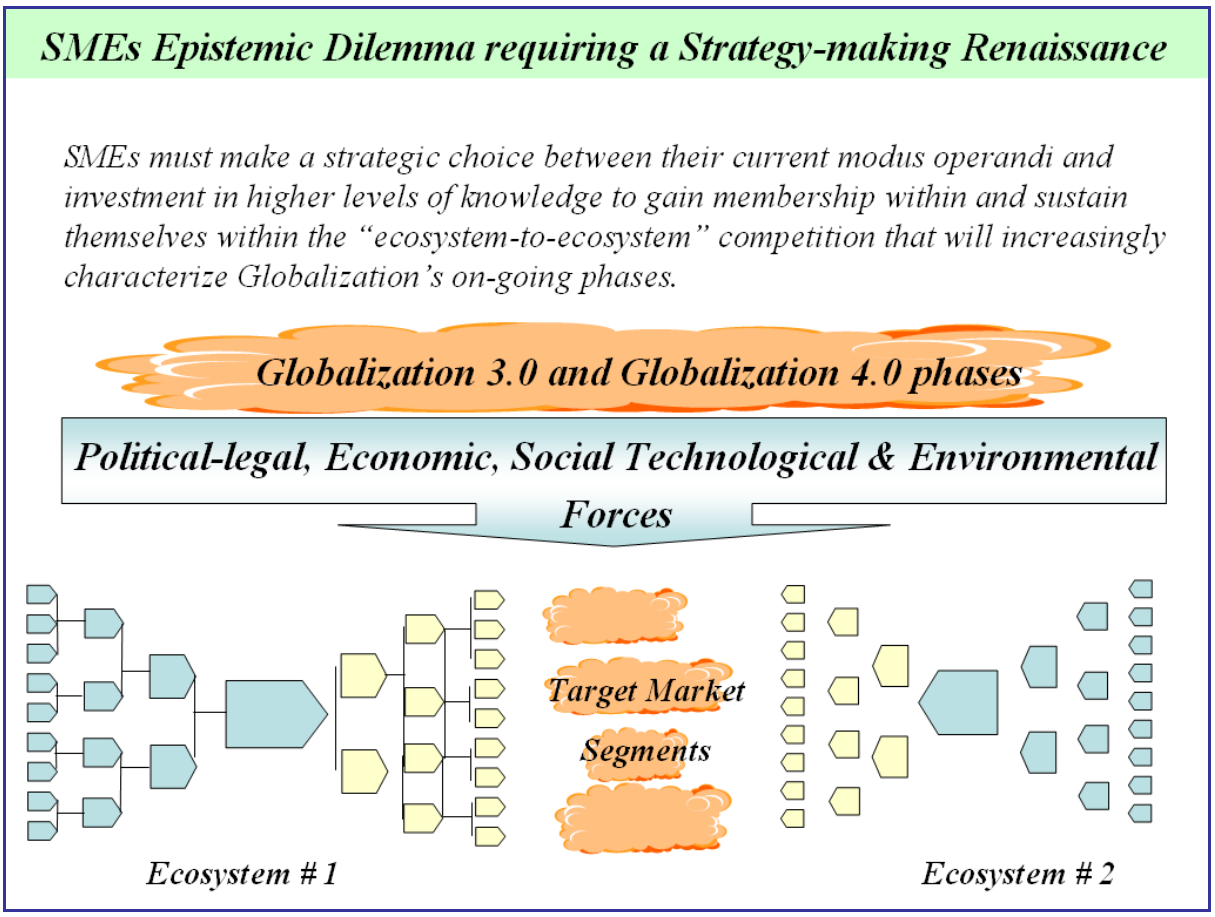

Figure 2.30 – SME strategy-making lessons from competitions between digital business ecosystems

As illustrated in Figure 2.30 the Post-2000 era is characterized by the dynamics of the PESTE forces. These macro-economic forces are changing at a rate and velocity that it is impossible for any organization on its own to be able to satisfy customer demands under the impact of the changing macro-economic PESTE forces.

Within the supportive environment of a business ecosystem, resources can be procured and mobilized in a read-to-deploy fashion in respond to changes imposed by the dynamics of the PESTE.

The challenge of the SME strategy-making exercise is the development of the ecosystems if one does not exist or the invitation required to join one that would be well suited with a good strategic fit.

2.3.10 Time-based Competition

"Fulfillment Velocity" in every stage of the product Development Life Cycle is the key ingredient within the concept of "Time-based-Competition". First promoted by Stalk 1988 (a management consultant with the Boston Consulting Group), the concept offers valuable lessons for SME strategy-making, as one of the strategic response (that need to be cultivated) in order to satisfy the dynamics and demands of the global economy. The first hint of the importance of this strategy involved the "Just-in-Time" approach and its prominent role in the success of the acclaimed Toyota Production System. The Post-2000 ear of business however provides strong evidence on the need for time-based approaches to strategy-making and the achievement of competitive advantage. Stalk 1998 argues that velocity management strategies are responsible for the success behind the "variety wars" and related strategies such as flexible manufacturing, continued development, and the delivery of mass customized solutions.

Stalk 1998 argues that this strategic option can deliver business growth because all other strategic options of dealing with competitors results in either loss of markets or reduced profitability. The net result is that more product innovations are brought to market sooner, with a higher degree of profitability than compared with the approach to sort all product challenges in the research laboratories first before taking the product to market.

2.3.11 Platforms Growth

Evans and Schmalensee (2007) have proposed the need for Post-2000 streategies to embrace their "Catalyst Code" - which brings together the full ecosystem membership for collaborative and mutual benefit while providing mobility, identity and reliability and shared equity in the collaborative enterprise. As Professors involved with cutting edge technologies in Europe and at MIT, they have outlined how the successes of Post-2000 firms such as Google and Apple, etc are underpinned by the focus on business ecosystems as the new unit of competition in EGI.***:***

SME strategy-making must equally become familiarized and evaluate the concept of "Growth Development Platforms" as the catalyst to automate their offerings and of their business ecosystem membership. While the opportunity of creating dedicated platforms could be resource-demanding, the limitations do not apply if SME strategy-making works around and utilizes publically available "platform-type" business growth infrastructure.

SMEs could therefore benefit by evaluating the concept in the context of the "Bolero Export Documentation and Export Trade Finance" platform. Again the focus should not be on SMEs trying to compete with Bolero or the parallel Multi-national version known as "Trade Technologies" (per www.Tradetechnologies.com). Rather the challenge is to identify portions of the service in their generic form and utilize these generic functions in a strategic "mix and match" re-configuration for the SMEs' own core business domains.

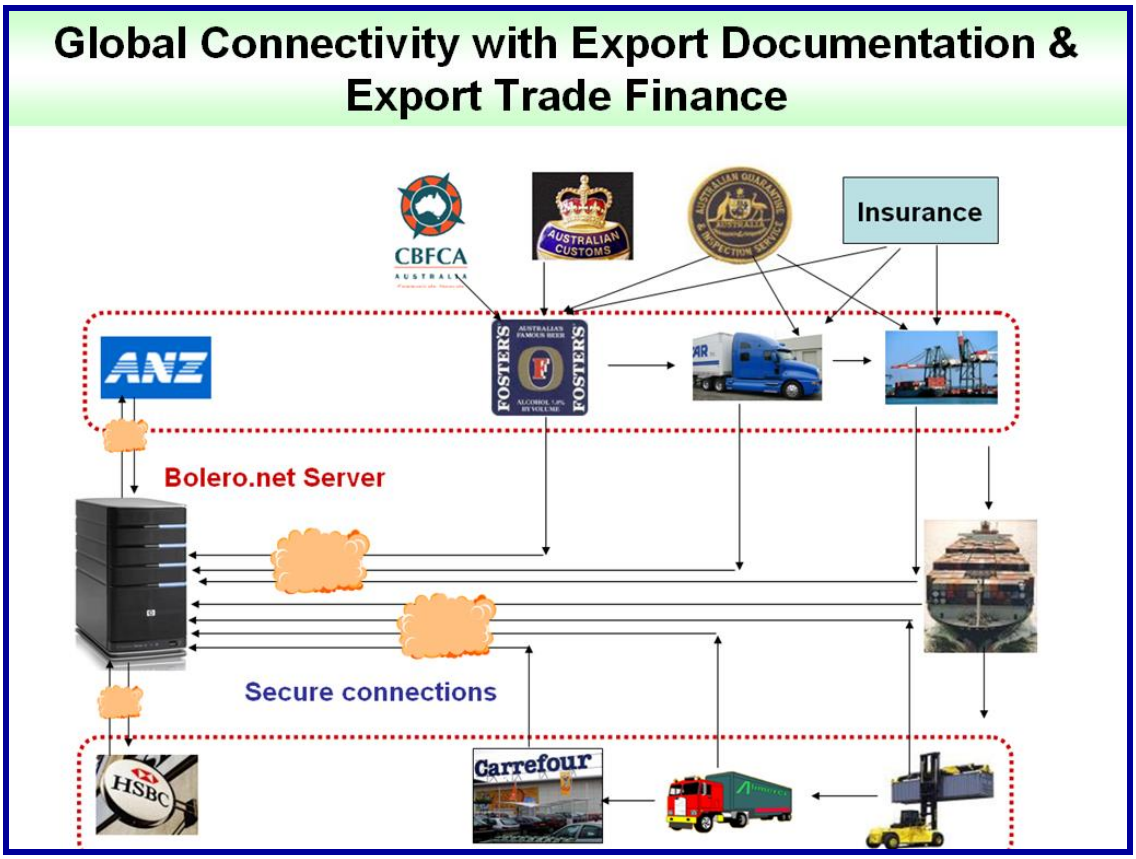

Figure 2.31 – SME strategy-making using "Mix and Match" concepts for strategic architecture and business development.

SMEs for example need to evaluate the manner in which special purpose Bolero international and trade finance trading platform set up by a consortium of European Banks can deliver generic modules for SME re-configuration and business innovation. Figure 2.31 for example illustrates the Post-2000 business export development landscape for SME strategy-making.

In the physical system, three distinct flows take place – (i) the exported goods low in one direction, while; (ii) the certifying documents that the goods are in transit, complete with regulatory approvals, etc, flow in the opposite direction; and (iii) payments flow between the two banks respectively supporting the exporter and the importer.

The Bolero system is a Post-2000 web based system which intervenes within the goods flow, the information flow, and the payment flow sub-systems, by offering an electronic version as substitute for the conventional paper-based documents in each of these domains. All parties involved are pre- registered with the Bolero system, and payments are made when each party fulfills their obligations and provides the required documentary proof, on-line in electronic format to the central Bolaro server.

SME strategy-making objectives seeking to utilize the concept of the "Growth Development Platform" require business management and business organizational strategies of the type presented by Zook (2007) who argues for businesses to define themselves first and identify their "adjacencies".

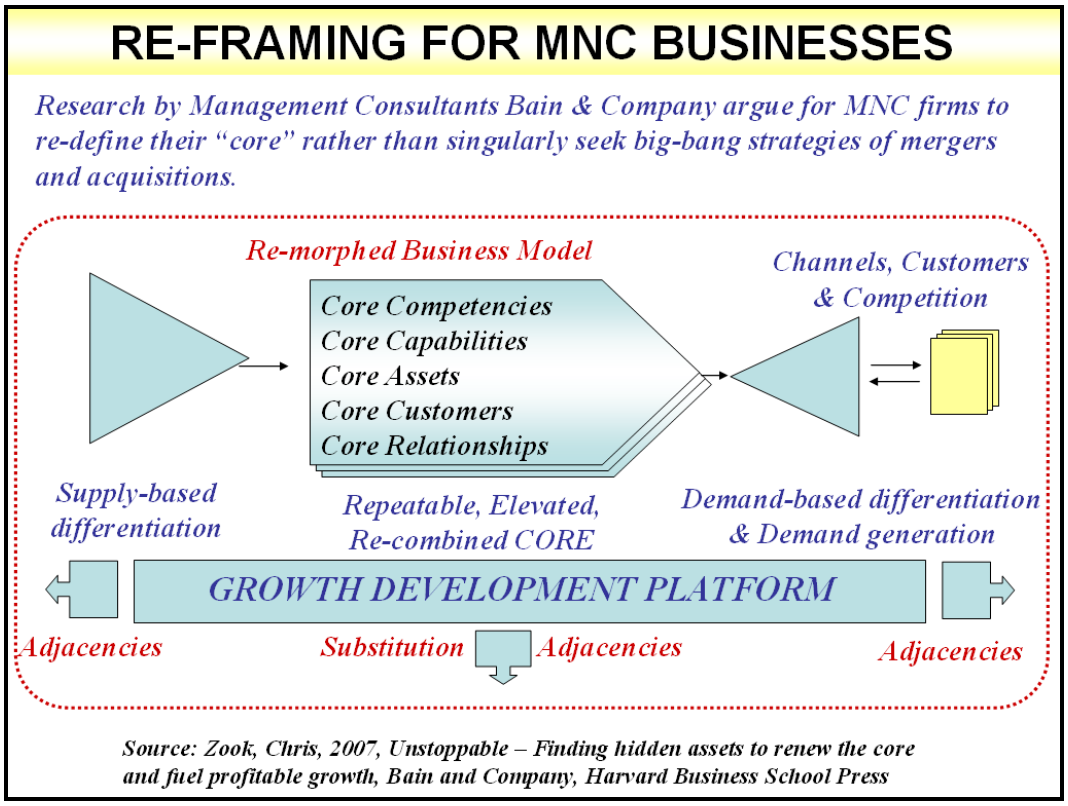

Figure 2.32 – Conceptualizing Growth Development Platform issues for SME strategy-making and customization.

In Figure 2.32 for example, SMEs first need to characterize their business by reflecting on their "Core portfolio" of competencies (internal), capabilities (external), assets, customers and relationships. Each of these as illustrated could be the potential bridge or catalyst to help form the platform that hosts and launches new business opportunities and innovations on behalf of the developer of the platform.

2.3.12 Machine-2-Machine Business Processing Systems

The issues of security in the Post-2000 era offers a further range of opportunities for SME stategy-making. Almost every mode of transportation involving international trade is being subject to reassessment on the issue of security and prevention of terrorism. In this context the entire supply chain operations negotiated by a product being traded from one nation to another must be conducted with full visibility in real-time. Agin SMEs are at their best in the local environments native to the IR-grid and when goods enter into a country or are being exported, SMEs could gain from the technologies being applied.

The key factor for SME consideration is the use of Machine-to-Machine communication and real-time data exchange between infrastructure and the products under transit (which are specifically embedded with MEMS/ RFID / Zigbee technologies. The embedded technologies facilitate microtransmission of data and internet connectivity between themselves and the digital infrastrucutre established by security organizations and government agencies.

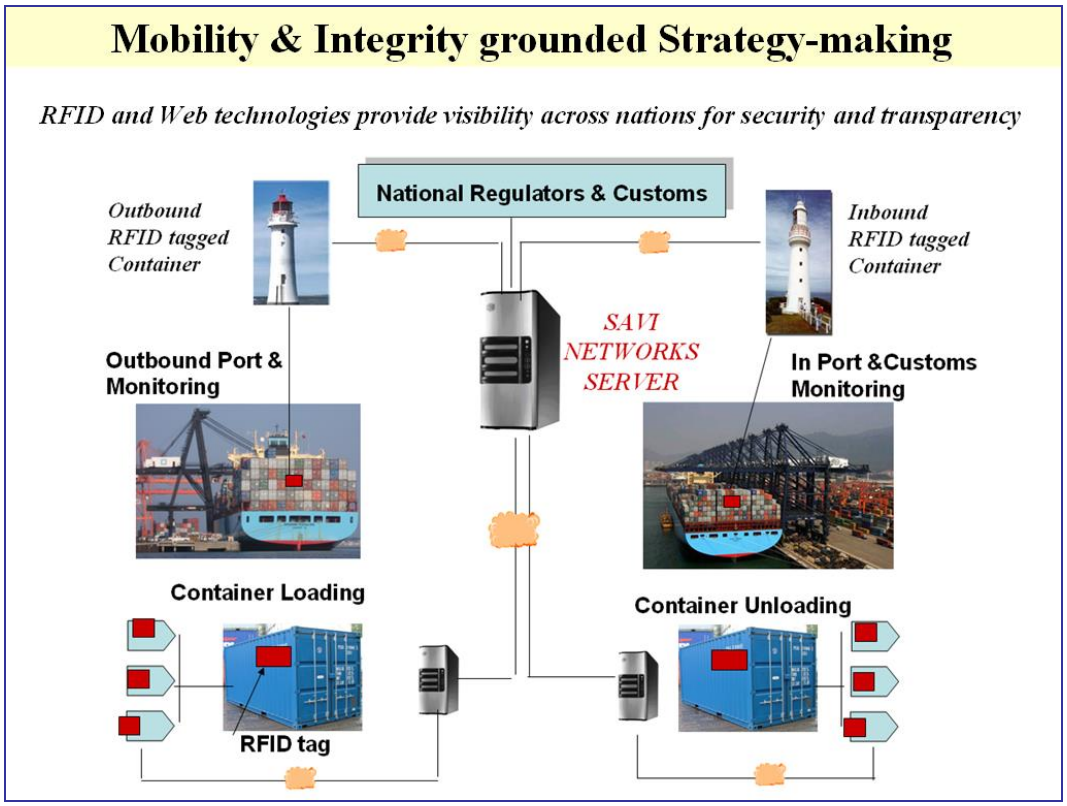

Figure 2.33 – SME strategy making that can benefit from Machine-to-Machine communication and data sharing technologies

Again the lesson for SME stategy-making is not to directly compete with the existing developers and MNC users of the Machine-to-Machine technologies and infrastructure providers. Rather the focus needs to be on the transferability and re-configuration of the technologies in projects and business innovations for the benefit fot he SME.

Figure 2.33 for example illustrates the manner in which Machine-to-Machine communication can track and trace container shipments across the globe. The tracking commences with the addition of RFID tags and or mobile Zigbee networks that are embedded within the containers. Data from the embedded technologies and systems and the shipping container as well are recorded to the Central Server, at every stage of the supply chain route until destination. Government agencies and security contractors are able to interpret this data and make decisions on the level of risk that could be posed to the transit countries or in their final destination.

The US-based firm Savi Networks (www.savi.com) provides the service that can be affixed to both the mobile assets being monitored and the fixed infrastructure that monitors their entry into ports, transfer stations, transit bays, etc. Savi Networks sets up the automated communication links and the data-base recording and reporting to customs authorities and security agencies.

The lessons for SME stategy-making is to utilize the generic functions and the generic processes that will bneed to be applied, when the SME organizes private flows of goods or exchanges. For example, SME firms such as the start-up Kogan (at www.kogan.com) is seeking to out-compete established retailers such as Harvey Norman and GoodGuys and other retailers. The goods that

Kogan seeks to bring into the country will need to be subject to the same levels of security clearnances as general container type cargo. The mastery over these technologies have been identified as one of the factors responsible for its current successes.

2.3.13 Interessement and Profit Sharing

The major consideration for SME stategy-making is the need to manage the business ecosystem created for the advancement of the SME. In this context integrity and profit sharing in an equitable manner would dictate success. French business schools specifically advocate the concept of "strategic interessement" or profit sharing within business ecosystems as the glue for mutal and collaborative growth.
Figure 2.34 illustrates the most commonly known and globally successful "interessement-based" stategy used by the mobile phone industry.

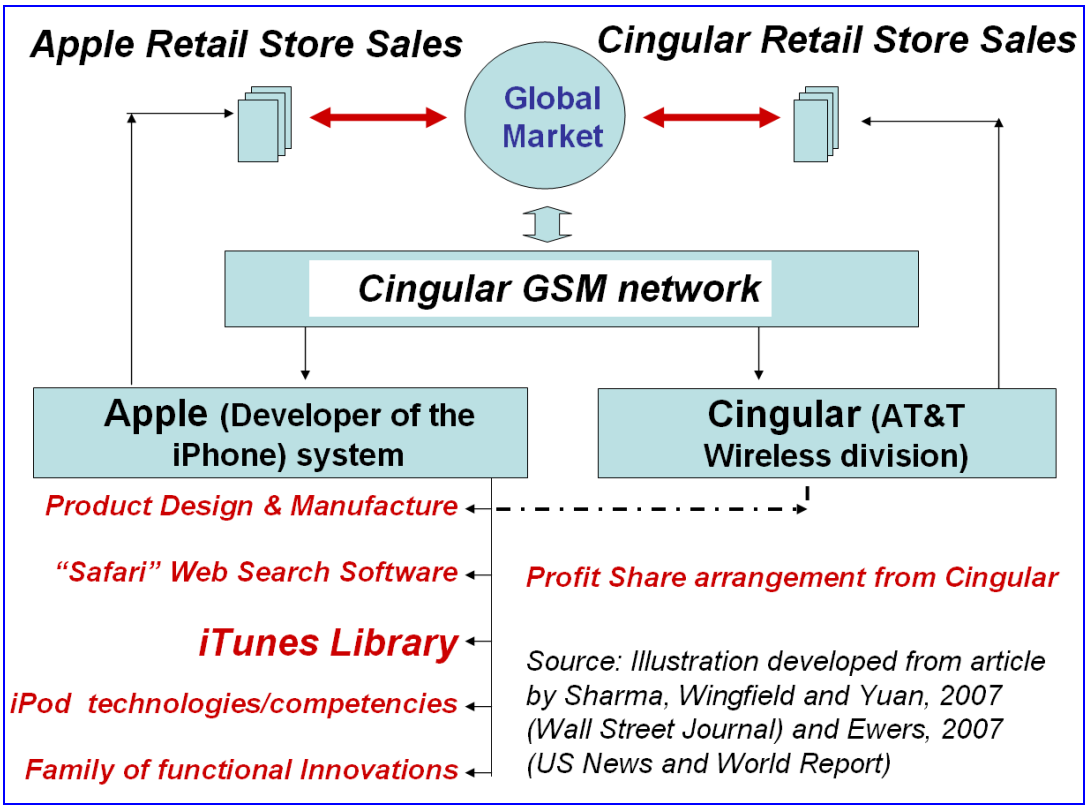

Figure 2.34 – Mimicking the concept of interessement or profit sharing between business ecosystem members

The concept of "interessement" has been credited to the famed economist Joseph Schumpeter, who envisaged the need for any inventor to bring together the twin universes of the innovation and the benefits it brings to the end-user. Interessement according to Akrich, Callon and Latour (2002), brings closer the technology (and its creative and production trains) to the market space of the end-user. The focus is on ensuring that there is profit-sharing with the introduction of the innovation – irrespective of whether it is directly or indirectly achieved.

In fact the strategic impact of the concept is so well established that OEM manufacturers of innovative products actively factor the involvement of their future partners within the development processes being carried out by the OEM.

The concept and lessons for SME strategy-making are available for other industries beyond mobile communication. Akrich, Callon and Latour (2002) for example have argued for a full strategy-making version that actively incorporates the profit sharing of future successes in order to ensure ultimate and accelerated success. In their "The key to success in innovation" they discuss SME relevant experiences such as Solar Photovoltaic installations that required such consideration.

Figure 2.35 – Lessons for SME strategy-making from the global aircraft manufacturing industry

Sirikin, Hemerling, and Battacharya (2008) have researched this further and have argued that the concept of "Interessement" is a key requirement for the specific development and acceptance of innovation concepts. In a form of Risk Management, the use of the interessement concept guides "innovation in making" as shown in this diagram.

In this case study they report on the strategies adopted by the Embraer Group. This Brazilian aircraft manufacturer (www.embraer.com) having utilized the single circular fuselage section then came to the conclusion on its limitations. The fuselage design needed a radical change from the restrictions imposed by the single profile, even though the circular design provided inherent strength.

The innovative concept finally agreed upon was to utilize not one but two circular fuselage sections. Their innovation used two circular sections that fused into each other to deliver the benefits of increased space for all stakeholders that included passengers and air freight. Importantly for SME strategy-making is the embedding of interesseement within the innovation-in-making process actively involving all stakeholders with the aircraft innovation. The interessment approach ensured that the needs and profitability of the aircraft operators were taken into consideration at the very earliest stage of the innovation process. This active joint development of integrating the luggage and freight requirements as potential customers has been credited by Sirkin, et al., (2008) as the reason behind the phenomenal commercial success of the innovation.

2.3.14 Inverted Pyramid

The strong message in publications by academia and industry is that lessons on strategy-making from the Toyota Automotive Company cannot be ignored. Strategies based on the famed Toyota Production System (TPS) have surpassed all competitors in scale, income, production volumes, and profitability and importantly in quality. Also well known and acknowledge are the facts that Toyota's Number One position in the global auto-industry has been generated by its "Toyota Production System".

Less well known however are the epistemic foundations and the inclusive nature of the knowledge that is generated from all stakeholders and which is systematically incorporated and embedded within the famed Toyota Production System. Strategy making with TPS is the result of the combined inputs from factory-floor staff through to designers, marketers, component suppliers, Tier 1, 2 and 3 partners, and with specific insights and perspectives obtained from the entire business ecosystem membership. Simerly (1992) provides an interesting description of these ecosystem stakeholders – calling them vertical and horizontal "keiretsus".

According to Simerly (1992), Toyota's "Vertical keiretsus" involve their supplier companies with Toyota owning stock in the suppliers and thereby receiving high quality service in the mutually beneficial relationship. Toyota's "Horizontal keiretsus" involve major banks, insurance firms, a trust banking company, a trading company, and several large manufacturers, owning stock in one another; with interlocking director groups. Overall direction of Toyota's successes is attributed to the contributions made both inside and outside Toyota.

Naturally SME firms cannot hope to instantly achieve the successes, the global competitiveness and dominance of the Toyota Corporation. On the other hand however, as illustrated in Figure 2.xx, SMEs could benefit from the underlying "mind" and "person" management skills embedded within the TPS.

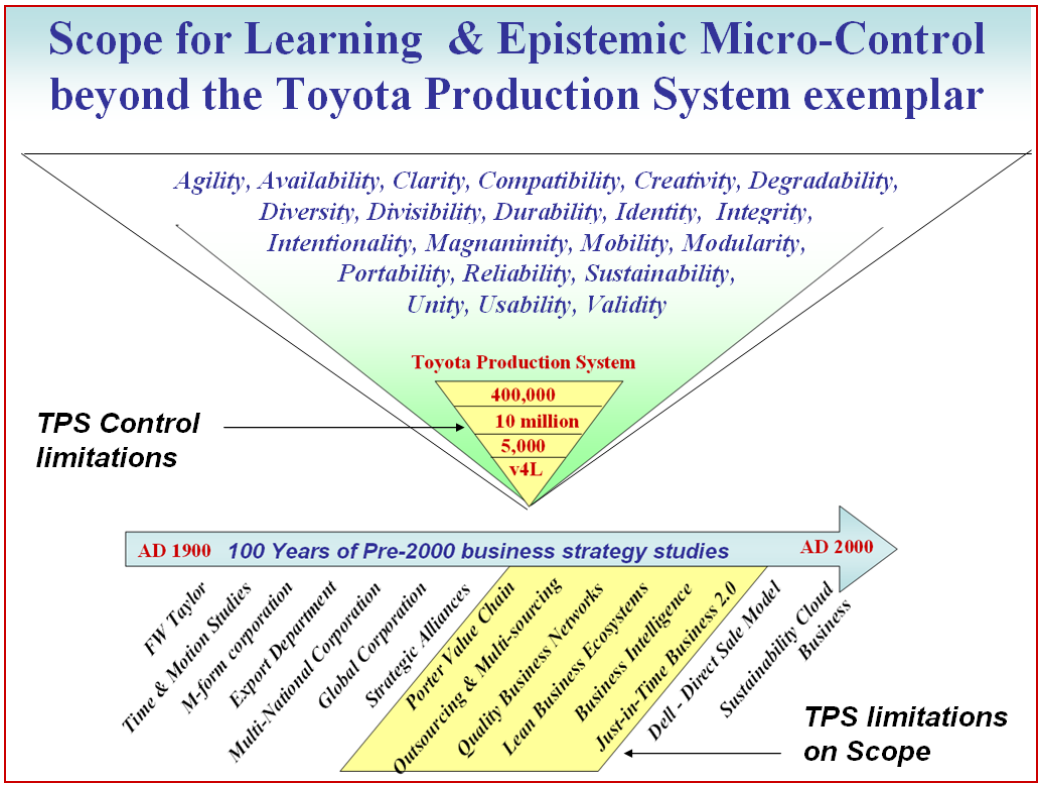

Figure 2.36 – SME strategy-making lessons from the famed Toyota Production System approach to business ecosystem management

In this context Figure 2.36 illustrates the manner in which the "Inverted TPS" pyramid (shown in the upper section of the drawing) is made to systematically guide, transform and control the typical manufacturing operations (that are listed in the lower part of the diagram). The diagram also shows the merging that takes place in both the conceptual disciplines and the control factors that separately reside within the Toyota Production System and the 100 years of "legacy-based" business strategy-making studies.

Strategy making lessons on the TPS are extensively outlined by Iyer, Seshadri, and Vasher (2009) on its strategic approaches and underlying principles. Liker and Hoseus (2008) have focused on the "heart and soul" and the famed balancing of "legacy-based" strategic approaches contained within its V4L Framework.

Similar to the concept of the 4Ps in Marketing, the V4L framework focuses on generating a balance of key supply chain parameters, viz:
- the variety of products that need to be offered,
- the velocity that needs to be created and managed in the product flow system,
- the variability of outcomes that need to be managed and compared against forecasts, and
- the visibility of processes to enable learning.

The TPS V4L framework requires and promotes continuous improvement and structured reflection on the success in balancing variety, velocity, variability, and visibility across the supply chain.

While these "interaction and balance" issues are captured in the illustration, it is argued that the "core values" of the inverted pyramid essentially hold the lessons for SME strategy-making.

Relatively hidden among the numerous pronouncements are the statements by the management at Toyota that the "values" embedded within the Inverted Pyramid are indeed the core resource of TPS. The lessons for SMEs are the need to establish and manage this dynamic control system – that can continuously adapt and self-improve itself. This is because of the design of the core of the inverted pyramid – as the heart and mind of the enterprise combines Pre-2000 with Post-2000 knowledge and wisdom as they emerge.

The challenge for SME strategy-making is therefore to "de-construct" the macro-mega-concept of the Toyota Production System and focus on its inner core and the dynamic integration of Pre-2000 and Post-2000 knowledge. To do otherwise would be to be blinded by the scale and scope for enhancing the epistemic lessons available from the well renowned Toyota Production System.

2.3.15 HVC and CSO

The lessons from Toyota are being used in multiple industries including thos auto-industry competitors. Each of them have tried to develop their customized version – represented by Hybrid Value Chains (HVC). Some have even advanced into adding on the concept of integrating inputs from Citizen Service Organizations (CSO) within the resulting strategic development and decision-making processes.

The engaging the end-user and stakeholder not just in transactional activities but also in strategic delivery of the required outcomes extends beyond the lessons available from the Toyota Production System. Case studies from around the world are abounding in the successes gained from the integration of the commercial business sector with the "Citizen Service" sector. In their presentation of numerous examples Drayton and Budinich 2010 argue strongly that the emergence of the Citizen Service Organization (CSO) is successfully changing the methods of doing business in emerging markets.

New strategies are evolving in which traditional business approaches are adapting to the massive resource base and the knowledge-base that exists within the CSOs – some being "not-for-profit" organizations. Others are a newly emerging "activist groups" that provide a much sharper focus than their mass-scale low-cost for-profit "global conscience" enterprises.

The Porter Value Chain for example has been hybridized into the new concept of the Hybrid Value Chain in which significant segments of the traditional value chain activities are carried out with the active support of Citizen Service Organizations. These CSOs function as both consumers and facilitators and strategy-making guides. According to research by Drayton and Budinich 2010, some of the world's largest corporations including General Electric are in active support of the hybrid business models, which offer strategic benefits such as:

1. Remain large in scale and simultaneously operate with agility to cross national and cultural borders
2. Create multiple order of business value beyond the traditional expectations of the low-cost mass-markets.

3. Deliver product or service that neither partner could provide its own.
4. Attain environmental sustainability and scalability with relative ease and on which profitability depends
5. Harvest system-changing ideas from the knowledge-base of the local markets that can provide the basis for new competition.

The global alliances between major banks and the tiny CSO developed "micro-lending" institutions are a further case for SME strategy-making consideration. The Nobel Laureate's Muhammad Yunus's Grameen Bank microcredit idea of 30 years ago has been expanded with the cooperation of global banks and global MNC from the developed world. The new combined offerings include mobile telecommunications, internet connectivity, health care and insurance products as well as "boutique" financial services.

2.3.16 Disposable Strategies

The consideration of "Disposable strategies" is a new line of advice from the Boston Consulting Group (Stalk 2008) to address the inherent uncertainty of the global sector's shorter product and business-model life cycles. This is the same group responsible for developing the famous BCG Matrix that categorized products into stars, dogs, milking cows and question marks and recommended separate strategies for each of these categories. The BCG Matrix became a popular and mandatory segment within the MBA curriculum and business strategy studies. It is in this context that their advice on disposable strategies is being well received, with its focus on strategies that need to deliver

- Supply Chain Gymnastics - with strategies that can leverage and benefit the global firm from the agility, visibility, mobility and flexibility that should be embedded within.
- Sidestepping Economies of Scale – with strategies to try before embarking on global scale production plants. Stalk 2008 argues that the initial loss of cost advantages would be more than compensated by the benefits of an initial trial period that uses "disposable factories" in its interim and gains from the immediate availability and deployment of outsourced-based supply chain inputs.
- Dynamic Pricing – with strategies to monitor demand by the minute and to develop customer value propositions that assist clients in satisfying the varying demands of the end-user customers.
- Embracing Complexity – with strategies that can handle the variations and the velocity of changes taking place in demographics, customer taste, communication infrastructure, etc., and
- Infinite Bandwidth – with strategies that recreates the physical world with a virtual world equivalent in parallel to provide the information and intelligence needs for strategy and decision-making. Stalk 2008 urges multi-national corporations to seize the advantage this represents for enhanced operational efficiency, new business models, and as yet unimagined business success.

2.3.17 Dynamic Response strategies

SME strategy-making can benefit from the Bio-medical industry and their record of innovations and streategy development involving regenerative medicine, stem cells, cancer treatment, and nano-scale imaging of physiological process and organs

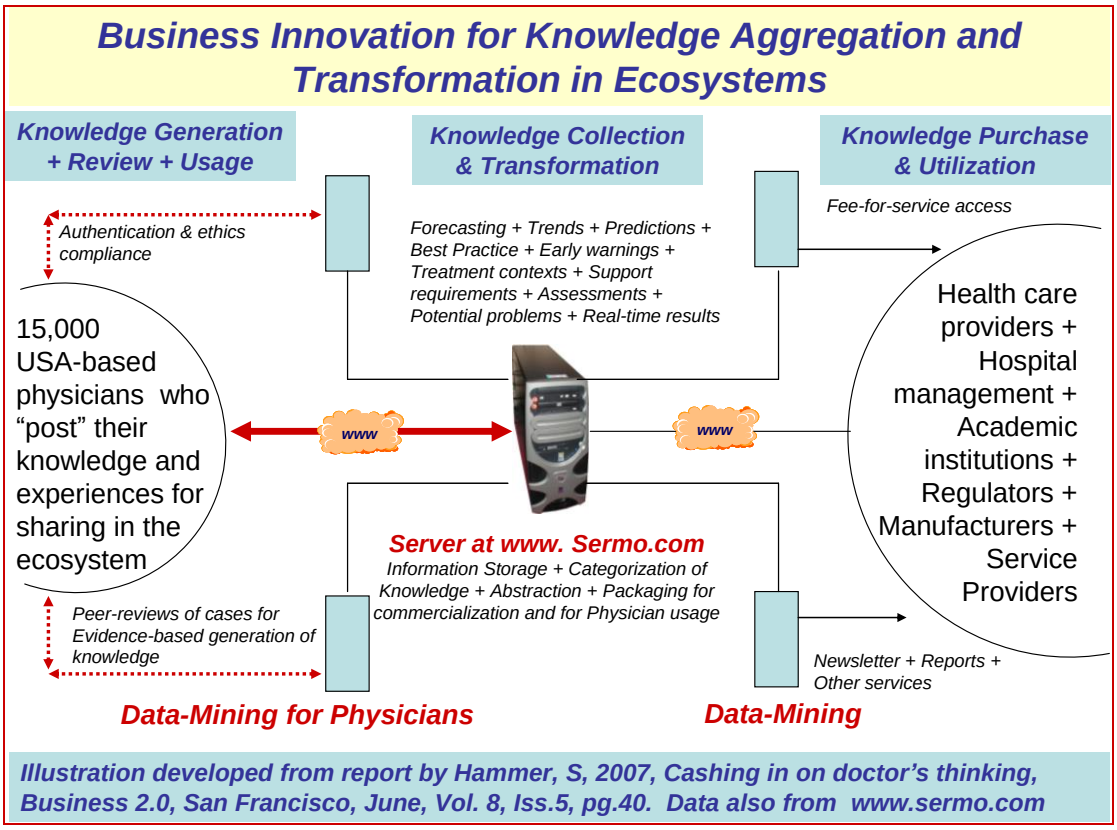

Figure 2.37 – Strategy-making lesson from Medical Industry business ecosystem.

Illustrated in Figure 2.37 for example is an innovative digital business ecosystem that was created in 1998 where none existed before. The start-up SME's strategy was to develop a knowledge integration platform for knowledge-sharing among medical doctors. This is achieved by the setting up of an internet-server, represented by the icon in the centre of the diagram. The clinical experiences and knowledge of doctors in their treatment regimes are communicated to theircounterparts through the web-platform, as shown in the top left of the drawing. The Server system is fitted with Data-mining application software that cann re-present the collected information to the doctors in a more usable form, as shown in the lower left.

The SME lessons on commercial innovation is based on how the same knowledge used by the treatment doctors can be re-formatted and made into valuable information=products needed by suppliers to the medical industry. The intending buyers of these information-rich products are the pharmaceutical manufacturers, the medical insurers, and the hospitals and the service providers, etc, shown n the right of the diagram.

Origianlly conceived as a hobby by Dr Daniel Palestrant MD, www.sermo.com has been transformed into a multi-million dollar business. (Source: For history see http://medinnovationblog.blogspot.com.au/2007/11/conversation-with-founder-of-sermo.html)

A further example of how SMEs can develop Dynamic Response strategies is available from the "Aircraft Health Flight Management System" developed by aircraft manufacturers such as Boeing and AirBus.

Figure 2.38 – The Strategy-making model that can service the operational health of industry/ manufacturing/ business systems.

Shown in the centre of the diagram is a Central server that monitors and records the entire life-cycle of each aircraft flight assignment. The server records the details of the flight gathered by the on-board computer, (top left of the numbered drawing icons) which is then transmitted to the Central Server via satellite (clockwise direction of icons) . Faults, alarms, or trends or events are therfore made available to the experts in Boeing or AirBus – to interpret, advise, make decisions or facilitate corrective action.

When the aircraft needs a specific component the Server-intelligence system facilitates procurement from the nearest stockist to the intended port of landing. The plane is met with the replacement part on hand and maintenance and repairs are carried out without delay.

SMEs can gain and capture several lessons from this web-enabled, information-rich emergency and routine maintenance system. Importantly the cost of these technologies are reducing and there are increasing cases where these functions and capabilities are embedded within the types of machines operated and maintained by SMEs. Importantly however is the mind-set of the SME to accept that this is the new business landscape of EGI expectations.

2.3.18 Critical Evaluation

This section has presented the case for SME strategy-making objectives to take note of thespecific range of models and resources that are available for almost immediate replication and technology-utilization. The importance of this segment of strategy-making resources is reflected in the findings of Professor Richard Solow who has estimated that approximately 80% of the productivity increases in the US economy can be directly attributed to technology-generated innovations and productivity enhancements.

Irrespective of their technological propensity in their native business niches, SMEs must therfore address this potential for the successful creation of innovations and new business opportunites in the emerging global economy. The research presented in the different technology-enabled business models argues the case for establishing "digital business ecosystems" in which the SME should play a pivotal role. Meta-level strategic approaches are necessary for the digital business ecosystem in which the SME is either the foundation member or the organizer and deliverer of a strategic function. In this context SMEs need to manage the transformation and utilization processes of the technology-based models presented earlier with a focus on:

(i) Becoming familiar with the availablity of the range of technologies (presented earlier) for SME relevant strategy-making
(ii) Envision and conceptualize the application of these technologies and resources for the delivery of SME relevant products and services to the global economy
(iii) Maintain a focus on the physical and theoretical "business models" whose functionality and productivity are to be enhanced by the digitization and technology upgrading
(iv) Learn to select the technology for the selected "physical and theoretical" applications and evaluate the different vendors of the technology for joint development with the SME strategy-making programs
(v) Learn to manage and collaborate the vendors as part of the digital business ecosystem that needs to be developed.

A key issue that needs to be considered by SMEs is that the technology-enabled opportunities for innovation and new business growth are on a continuing growth mode itself. In its own right, the Post-2000 versions of technology resources are reducing in price and simultaneously increasing their speed, functionality, reliability and ease of use. In the words of Professor Freeman Dyson, technology resources have become "commoditized" for use by the common person – and this in-turn sets of the new spiral of further development and growth. The concept of Digital Business Ecosystems therefore provides SMEs with a platform for their strategy-making.

It is in this context that Figure 2.39 presents an additional perspective of the functions outlined in Figure 2.38. In the system details presented in Figure 2.39, it becomes more obvious on how SMEs could "commoditize" and customize these technologies for their strategy-making objectives within the context of Digital Business Ecosystems, as outlined in the table below:.

Table 2.4 Translating a million-dollar MNC strategy into a $10,000 Strategy-making system and management of SME field-based physical operations.

MNC-High Technology Systems	*Equivalent SME strategies for EGI*
With reference to Figure 2.39, Startting at the top left corner in the diagram, an aircraft in flight experiencing difficulties could have their "digitized" conditions reported via satellite to the cental monitoring system, or Server (centre of the diagram).	Here SME supplied machines or SME maintained machines would be the subject for SME strategy-making. Injection Molding machines or process machines or pumps or mining plant or Pollution Control devices installed by the SME would replace the concept of the Aircraft
The Server system and its supporting resource-base (of parts, information, historial data, solutions, etc.), would then be able to interpret the conditions and makle decisions on the required solutions and the best option available. The Central Server is able to deliver this function because it is in possession of most of the historic facts with which the reported faults could be associated, directly or indirectly.	SMES can utilize the exact same system by working within a business ecosystem, one of whose members could be the supplier and manager of the Server system. Cloud-based services are available for this exacty function-delivery with a rapid set-up system offered with expert overview and operational management support made available for the SME
Digital database system provide this instant reference with real-time instantaneous response and digital content ready for transfer and exchange. For example, based on retrieved past case studies, the Server-system may decide that the fault-condition requires repalcement of a specific component. The Server would then establish contact with the "Maintenance Department" or group best able to rectify the situation.	The Cloud-based service within the business ecosystem would alert the SME on the performance failures or trends of the machines being maintained by the SME.
The full case history of the aircraft and the trouble-shooting diagnostics leading up to the decisions and the assumptions made could all be packaged in the digital transmission made for the attention of the Repaor and Maintenance crews. Additional support in the form of special instructions, advice on the vailablity of spare parts, etc. could also be provided.	The SME could access the Database records and the Analytical records and Dash-board type reports that could be generated by the SaaS type Cloud service. The SME can then effectively deliver the required physical service, ater knowing exactly the requirements of the remote machine system.

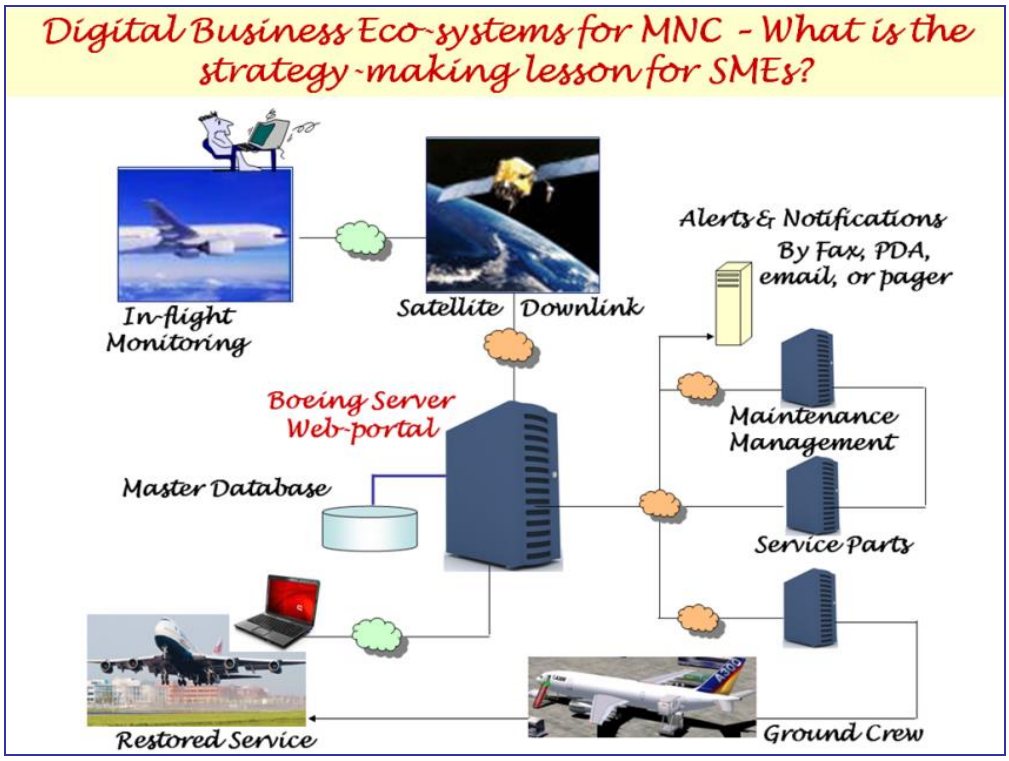

Figure 2.39 – The concept of Digital Business Ecosystems as the platform for SME strategy-making

A similar approach for SME strategy-making is availbel by selecting and transforming MNC generated or Post-2000 innovative start-up systems, as the Model for operational conversion.

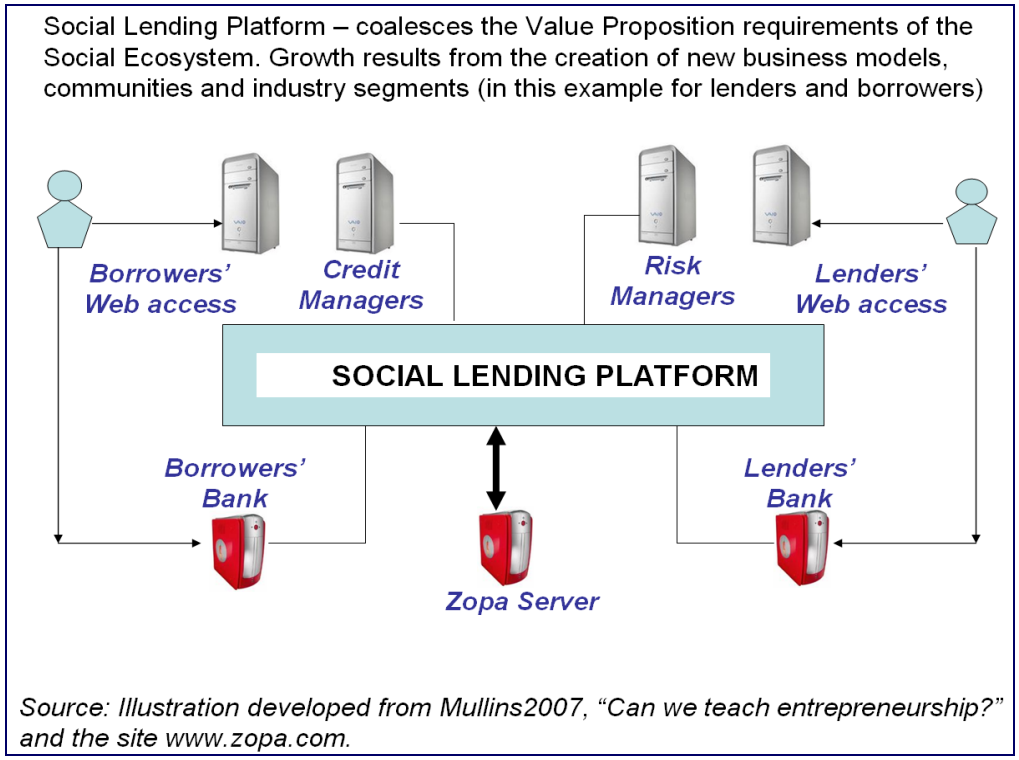

Figure 2.40 – Strategy-making generic model for mobilizing social and customer interests and responses in real time.

In Figure 2.40 for example, an SME type digital business ecosystem would be formed to procure and mobilize supplies of resources (left of the diagram), to those in need of purchasing those resources (buyers on the right of the diagram).

SME strategy making would also focus on the rapid establishment of a Centralized information-handling Servera dn Database system. Supply or availability of products and services would be managed to achieve a balance with the intending buyers.

The key challenge however is not the complexity or cost of the enabling technology but the development of the SME mind-set to achieve the renaissance and expansion of of their generally restricted level of operations

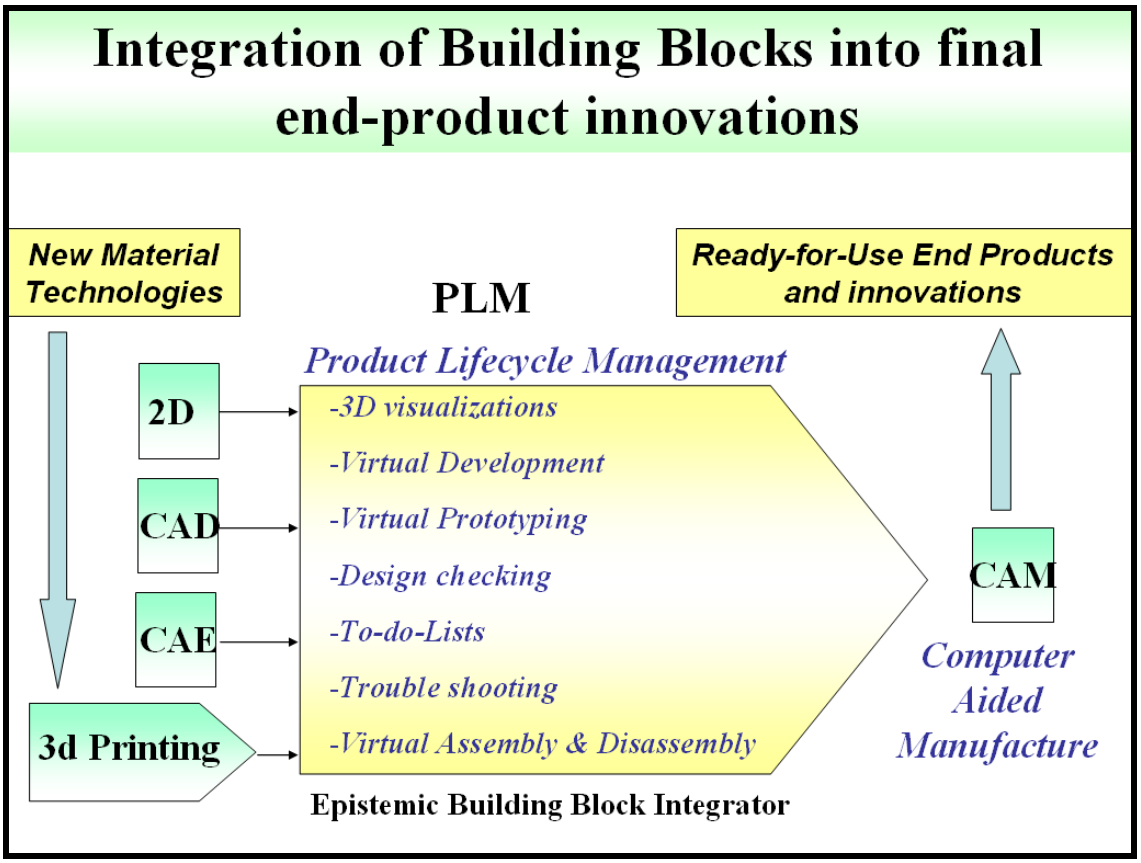

Figure 2.41 – The convergence of epistemologies using digital technologies for "Additive Manufacturing".

In a similar situation, Figure 2.41 illustrates an example of epistemic integration, in which building blocks from multiple disciplines can be assembled together within an integral package to produce an innovative product or an innovative process for new or existing products. The building blocks of 2D drawing, 3D drawing that can be carried out in Computer Assisted Drafting (CAD) diagrams can be further value added with Computer Aided Engineering (CAE) tools such as Finite Element Analysis (FEA) conducted on the total CAD product. An exemplar of such tools is the illustrated Product Lifecycle Management (PLM) application software program. PLM serves as the epistemic integrator of building blocks and in conjunction with 3d

printing (three dimensional) can revolutionize the Computer Aided Manufacturing (CAM) system. The key factor is that all of the epistemic building blocks are represented in the form of digital files and the trend in Post-2000 knowledge is to aggregate and integrate these building blocks once they are rendered into a common format. The new materials available from the plastics and bio-plastics sector once presented in colloidal form and size can be the "printing ink" of the final and sometime end-user products.

The Critical Evaluation can only be complete by illustrating the epistemic landscape in which SME strategy-making potential can be realized. The landscape is filled with opportunities resulting from the power of the internet, digital technological conversgence, the vailability of MNC operational models, and the direct parallels between SME physical activities and their parallel MNC operational divisions.

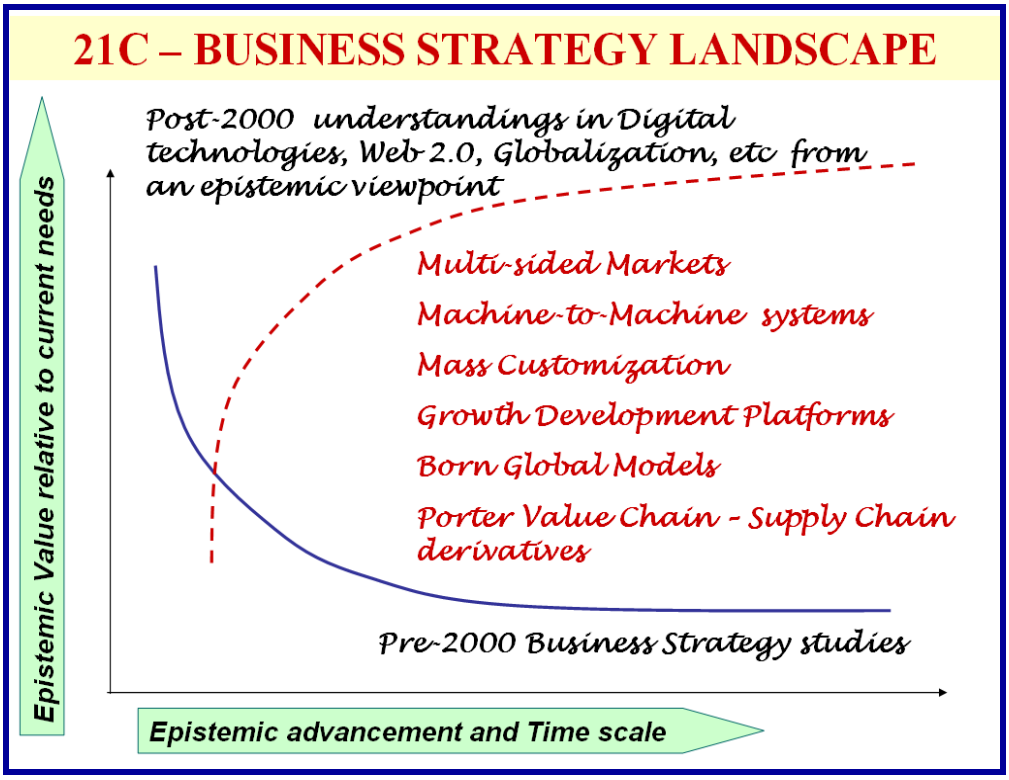

Figure 2.42 – Integrating Pre-2000 and Post-2000 strategy making to reverse the barriers for SME strategy – making.

These issues are intended for capture in Figure 2.42 which illustrates the epistemic position on the value of transforming and customizing published Pre-2000 Business Strategy studies (despite their original targets being MNC firms). With the changing demands of the Post-2000 business landscape, the relevance and value of the earlier MNC systems can indeed deliver the core concepts and total solution frames for SME strategy-making . From an epistemic viewpoint the challenge is acceptance by the SME-mindset that their Pre-2000 knowledge base for strategy making needs a new capacity or approach satisfy the needs of the global markets that are characterized by Mass Customization, Growth Development Platforms, etc.

2.4 Knowledge based Business Strategies

In this section we review the published knowledge based in the context of obtaining models, insights or perspectives for EGI-relevant business strategy making by SMEs.

At the start of the review we recognise the contributions made by the classical Greek civilization through Plato and Aristotle. From there we advance into areas of "Mainstream" epistemology and "formal" epistemology – again with the focus on extracting strategic thinking for the benefit of SMEs.

In the closing sections of this Review, we introduce the concepts of "Bio-epistemology" and relate cognitive thinking and strategy – making processes to the knowledge management system utilized by nature through the scientific discoveries of Post-2000 Systems Biology.

Knowledge is the underlying urge of the human spirit to do good, to be part of a social group with a set of values and the development of solutions.

From a biological viewpoint, the urge for goodness and well being involves the interactions of DNA, RNA, proteins, cells, and the latest group (microRNAs). Their combined actions create the nerve cell interactions that generate the creativity, the innovations and the spirit of working beyond the individual self. In the post-2000 era of business, this working beyond the self extends to the working of ecosystems of ecosystems, the phenomena of multi-sided market arrangements.

2.4.1 Aristotle and the combination of Mind, Matter and Composites

The era spanning the cross over from Pre-2000 to Post-2000 was characterised by a concerted attempt to introduce "Knowledge Management" as the solution for business in the dawning 21st century. In a response to the teachings of Peter Drucker, the Knowledge Management Movement emerged with a sincere attempt to provide a solution to the challenges of the Post-2000 business landscape. Knowledge as "justified True Belief" was portrayed as a "semi-fixed" construct that could be embedded into the strategic and operational processes of firms. It is in this context of filling-in "the missing link" that the Knowledge Management Movement sought to create a discipline and a domain.

In Figure 2.43 for example the expectation that could be created by the Knowledge Management simplification is that the typical process stages for strategy – making could be embedded with or encapsulated with "knowledge". The simplistic expectation is that generative and transformative:

- Ideation
- Motivation, and
- Collaboration would result

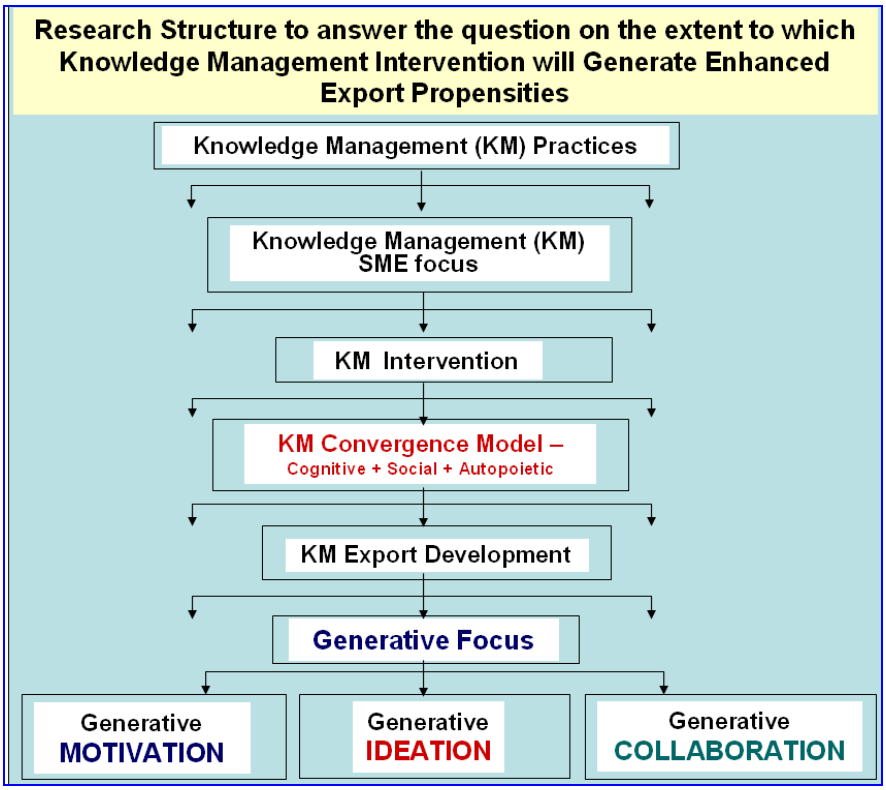

Figure 2.43 – Initial expectation on lessons for SME strategy-making from the Knowledge Management Movement

Classical Greek Civilization on Knowledge.

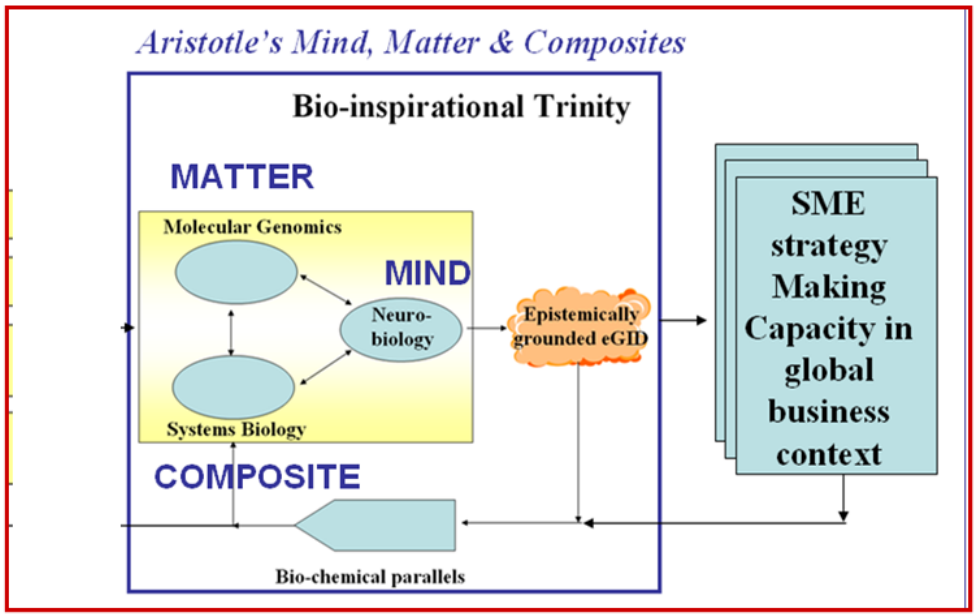

Figure 2.44 – Strategy lessons from the Aristotle on Knowledge Management for bio-epistemic inspiration

Aristotle's teachings on knowledge are valid today because it moved away from the "static" nature of knowledge, to one of a dynamic interaction and integration.

Figure 2.44 for example illustrate Aristotle's teachings that the Mind is separate from Matter and that the dynamic "composite" produces the required knowledge, with new insights and perspectives.

SMEs need to take note of this central tenant, because nearly 23 years later, the sciences of Molecular Biology and Neurobiology confirm how close Aristotle was to the truth. Unfortunately however the teachings of Aristotle have been the responsibility of "classical studies" and "Business Studies" were not able to extract this line of thinking.

In fact the Post-2000 findings in systems Biology, Molecular and Cellular Biology and Proteomics have started to create a valid representation of knowledge. The taxonomy illustrated in Figure 2.45 confirms the validity of the classical Aristotlian thinking on knowledge.

Aristotle's "Matter" can be considered to be the DNA building blocks of systems Biology.

The "Composites" are the DNA engineered proteins that are produced by the genes that make up the Aristotlian "Matter".

Finally the "Mind" is the control produced by newly recognised Post-2000 understandings of the Non-gene components of the DNA molecule.

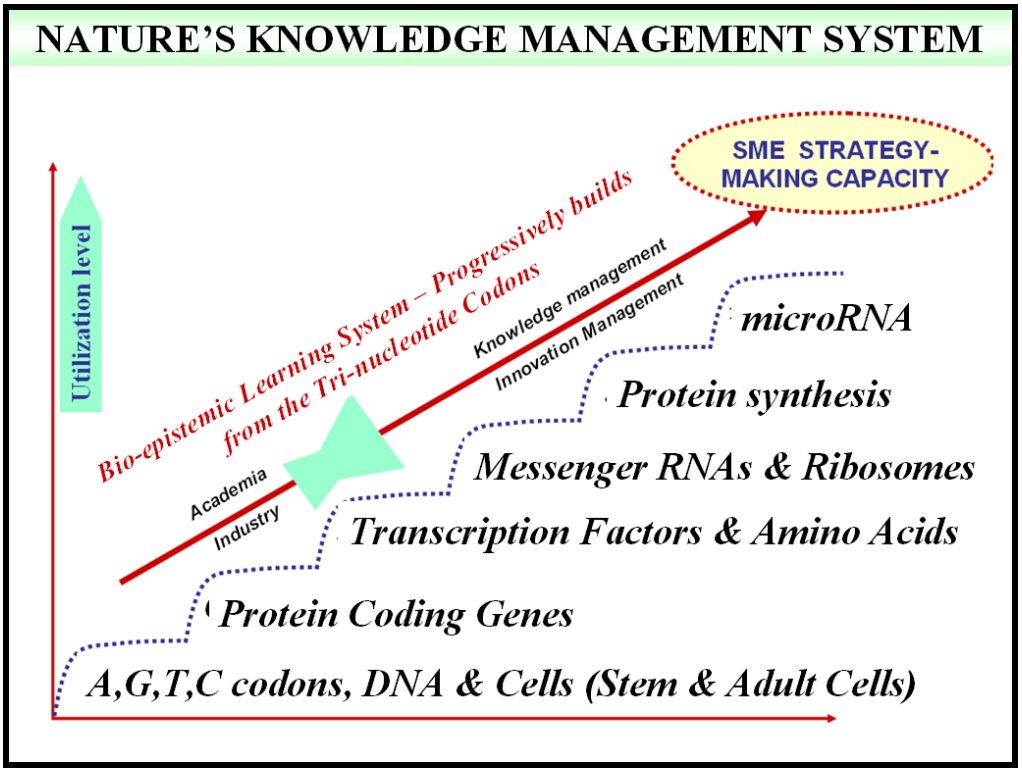

Figure 2.45 – The Bio-epistemic taxonomy for bio-inspiration from Genomics, Molecular, and Cellular Biology

The unified base of knowledge.

The findings of Post-2000 Systems Biology present the strong argument that the Knowledge Management system utilized by Nature is grounded on a "unified" code of four information molecules.

The sequencing and spatial layout of these four information molecules (represented by their first letters A, G, T, C) convey data, information, and knowledge.

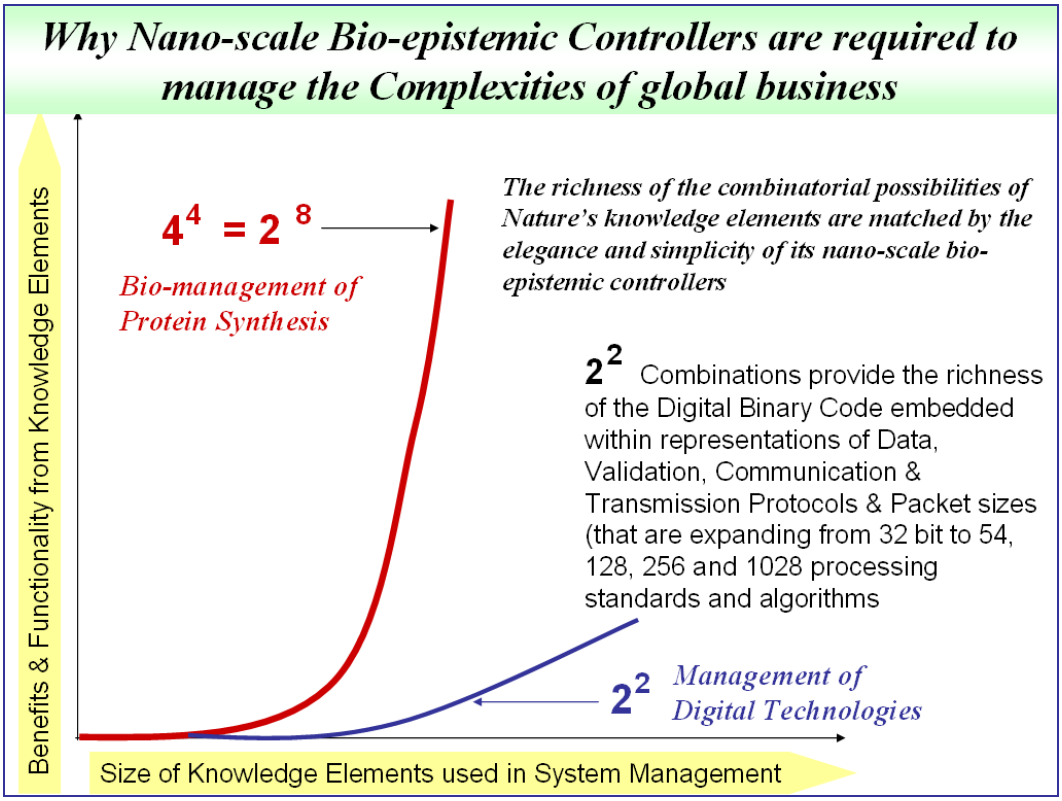

Figure 2.46 – Comparisons of the knowledge and innovation potential between Digital Systems and Nature's Knowledge Management System

This principle of a unified base of knowledge allows comparison with the unified base of the Digital Technology world.

In Figure 2.46, SMEs can compare the unified codes or basic structuring of knowledge by:

- Nature's knowledge management system, and
- Digital technologies

With Digital Technologies its "....." code involves combination of 0 and 1s, the Digital Economy has produced two combinations of product processes, or communication protocols.

The result has been the plethora of products that have flooded the Post-2000 global market with MP3 players, Ipods, Ipads, smart phones, and 3G and 4G wireless and broadband communications.

By comparison Nature uses not 2, but 4 information molecules. This results in 4^4 combinations or 2^8 for a direct comparison with the digital world.

Figure 2.46 therefore provides an illustration of the power of Nature's mind and thinking processes.

This is the lesson for SME strategy-making – "Think about the power of the Digital 2^2 combination and then extrapolate that power in the 2^8 regime.

2.4.2 Complex Adaptive Systems (CAS)

Complex Adaptive Systems does present itself as a viable candidate in the search for epistemic building blocks and models that can assist SMEs better understand the workings of the eGID. Some of the leading thinkers of the world, from cross disciplines are engaged in research to better understand the phenomena impacting on the human life from. With the use of strong mathematical tools, these scientists are able to model the development and the operation of systems such s cloud formations, and their further development into cyclones and tornados.

With the emerging Global Industry Development sector (eGID) displaying the characteristics of a "Complex System", the question must be raised s to whether "SME relevant strategy-making" can be modelled and whether its performance within the equally complex global market can be predicted.

In Figure 2.47 for example SMEs need to connect with the complexity of the eGID. Hence SME's could benefit from the study and potential deployment of CAS enabled strategies.

Figure 2.47 therefore presents a framework for the expected outcomes from CAS.

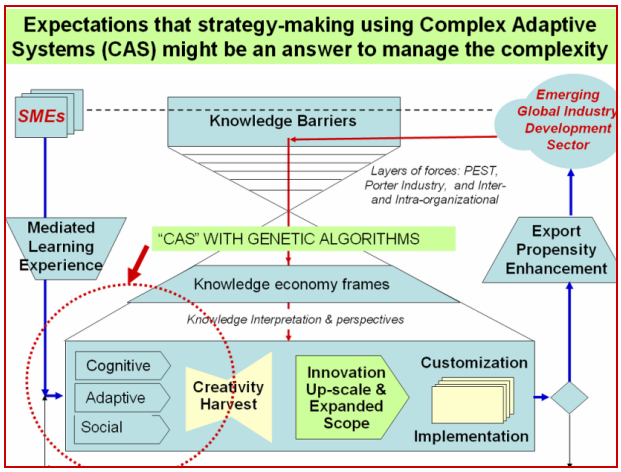

Figure 2.47 – Strategy-making lessons from the Santa Fe Institute and research on Complex Adaptive Systems

CAS are all around us --- in the natural world as well as in engineered environments. Examples include traffic and communication networks, human organizations, markets, economies, cities, insect colonies, ecosystems, the nervous and immune systems, living organisms, and life itself.

The research conducted in the Complex Adaptive Systems Lab has two purposes:

- To elucidate, and possibly control, the functioning of real complex adaptive systems by building mathematical and computational models.
- To use insights obtained from existing complex systems in designing better, smarter, more efficient engineered systems.

The notion that complex adaptive systems can be studied as a class is based on the assumption that the same fundamental principles underlie all complex systems, ranging from neurosciene to economics, molecular biology to traffic engineering, ecology to the internet. The discovery and application of these principles is the goal of complex systems research. Some of the fundamental attributes that characterize complex adaptive systems and distinguish them from systems that are merely "complicated" --- such as jet engines or computers --- are the following:

- Large numbers of locally interacting, relatively simple but nonlinear components.
- Spontaneous emergence of structures (e.g., groups, networks, etc.) and processes (e.g., competition, cooperation, communication, etc.) at multiple scales based on local interactions between components (self-organization).
- Distribution of control, information acquisition, information processing, and representation over the entire system.
- Adaptation of component behavior, resulting in implicit adaptation of the whole system.

The distributed, self-organized and multi-scale nature of complex systems makes them extremely scalable, robust, and flexible. These attributes allow them to survive, grow and evolve in changing environments without need for explicit repair or redesign. Since structure and process at large scales emerge spontaneously from small-scale interactions, there is no centralized control and no need to explicitly determine the state of the entire system. This avoids the combinatorial explosion seen in centrally controlled large-scale systems, and makes complex adaptive systems extremely scalable.

In addition to the schematic process flows set out in Figure 2.47, SME's need to approach CAS with a conceptual approach that focuses on epistemology.

Figure 2.48 illustrates the issues deserving of SME consideration for strategy-making. The lower- left portion of the page illustrates the "knowledge gap" which on its own is a highly dynamic system deserving of being a "CAS".

Hence the challenge for the potential use of CAS approaches is the need to be able to link the "Knowledge Gas CAS" with the "eGID CAS".

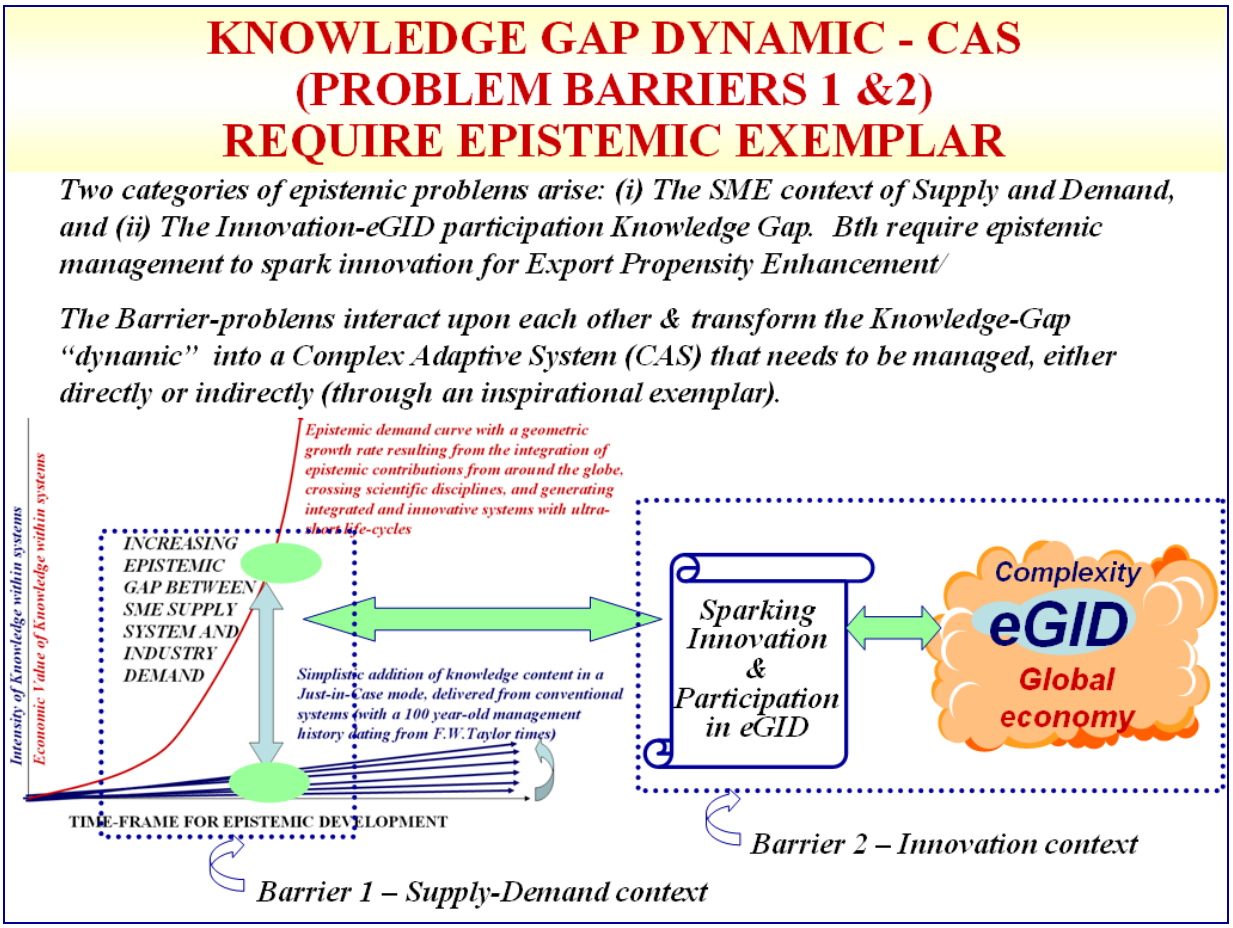

Figure 2.48 – Epistemic context of the Knowledge Gap and barriers preventing SME participation and innovation for emerging Global Industries

Half - life of knowledge in the SME context

The emerging Global Industry Development sector has decidedly stamped its control over the period or duration during which knowledge possessed would continue to be of value relevance and applicability.

Using the metaphor of "Radio – active" elements, knowledge too has a "half-life" limitation. The half life of knowledge in several industry sectors to which SMEs must be involved is less than 2 years. Global knowledge doubles in many industry sectors in less than 2 years (surveys of the World Bank and Patents registered by the global innovations). European Community stresses the importance of knowledge and the creation of networks and ecosystems as the bridge for the creation, development and diffusion of knowledge – filed in Knowledge economy. This provides the context for the Knowledge Gap diagram of Figure 2.49.

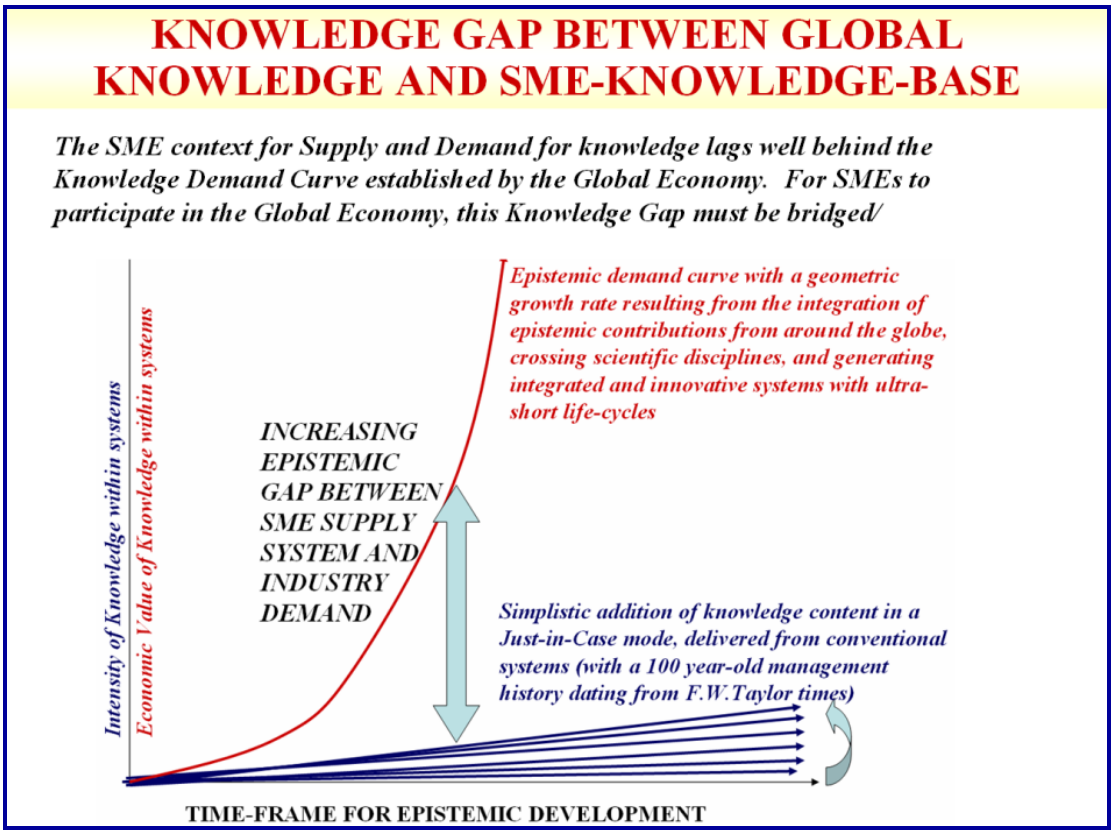

Figure 2.49 – Strategic challenge to manage the dynamics of the Knowledge Gap between SME strategic positions and the emerging Global Industry Domains (eGID)

The difference in the rate at which knowledge is produced in eGID and the effective rate at which unused SME knowledge is maintained is illustrated in Figure 2.49. This "knowledge gap" is one of the main reasons why SME strategy-making for eGID is a challenge.

2.4.3 The Knowledge Pyramid – of data, information, knowledge and wisdom

Post-2000 scholars in philosophy have attempted to bring the classical and modern approaches to knowledge within a framework. Researchers such as Henderson and Horgan (2011) for example have adopted a chronological approach that could be of value for knowledge – generated strategy-making for SMEs. They have critically evaluated the concepts of "a priori" and "posterior" knowledge (per the teachings of the philosopher Immanual Kaut) and the "Tacet" or personal dimensions (of philosopher Michael Polanyi).

The teachings of Joseph Schumpeter (acknowledged to be one of the greatest theoretical economists with his treatise on Creative Destruction) and of Thomas Kuhn (on Paradigm shifts in the history of Science) have also been incorporated into their representation of knowledge as a spectrum of human thought and endeavour.

2.4.4 From KM 1.0 through to KM 4.0 - Communities of Practice

An equally relevant and practical rendition of the importance and applicability of knowledge for SME strategy generation has been made by Hendricks (2006). Two important sub-concepts need to be presented for SME consideration:

- The concept of "Mainstream Epistemology" as different from "Formal Epistemology" and the need for their practical integration, and
- The concept of the "Epistemic Iceberg" – per the illustration in Figure 2.50.

Hendricks (2006) separation of "mainstream" and "formal" epistemologies does provide SMEs with the vital advice that would prevent them from going on the proverbial tangent.
The formal branch of epistemology could be seen as too theoretical and of less or no value to the practical-oriented SME. Hendricks however recommends that the practical "mainstream" segment be continually topped up with the key findings and concepts of the theoretical. In Figure 2.50 for example it can be argued that the knowledge segment within the triangular iceberg needs to grow into mainstream knowledge management (KM) from its KM 1.0 status to KM2.0 and beyond to KM 4.0. The KM 4.0 is the ultimate level because it involves the mixing of the theoretical and the practical in the neuronal environment of the Mind.

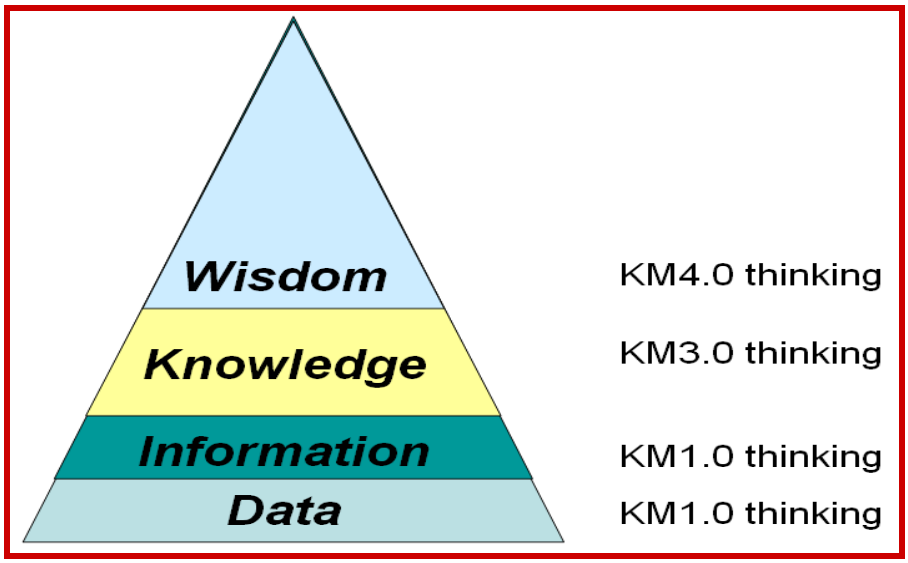

Figure 2.50 – The Epistemic Icebergy and the concept of a unified epistemology

Knowledge Management 1.0 (Data orientation), KM 2.0 (People-involved), and KM3.0 (social interactivity) all approach to the ultimate Knowledge Management 4.0 (the interaction between the self and the environment).

Communities of Practice

SME strategy-making needs to also take notice of the concept of "Communities of Practice" – as a formal process deployed by the Knowledge Management proponents to enhance, accelerate and expand knowledge sharing.

These Communities of Practice (CoP) groups of specialists are formed to become the central resource or knowledge centre for an organisation. As the expert group on their assigned topic, the CoP membership would be the lead agent to achieve faster outcomes.

For SME strategy-making there are three perspectives:

(i) Using the contacts within external CoP's as the entry strategy to gain information or knowledge on specific areas of expertise required by the SME.
(ii) Creating and nurturing CoP groups within SME organised business ecosystems
(iii) Establishing CoPs with a focus on innovation with a total package of expertise that focuses on the eGID sector.

Borzillo, Schmitt, and Antino (2012) provide a valid assessment of the organistion and management of a practical-oriented CoP group, with a focus on creating agility and a faster response to new market demands.

2.4.5 The Wisdom Dimension

From the concept of the Epistemic Iceberg of Hendricks (2006) per Figure 2.50, it can be argued that SMEs' need to extend their strategy – making skills beyond knowledge and include the "wisdom" dimension. This would provide them with "meta knowledge" or the knowledge to manage knowledge more effectively. Figure 2.51 for example incorporates in the left portion of the diagram, the working of the Aristolian "Mind". This is synonymous with wisdom wherein knowledge enables doing the right things.

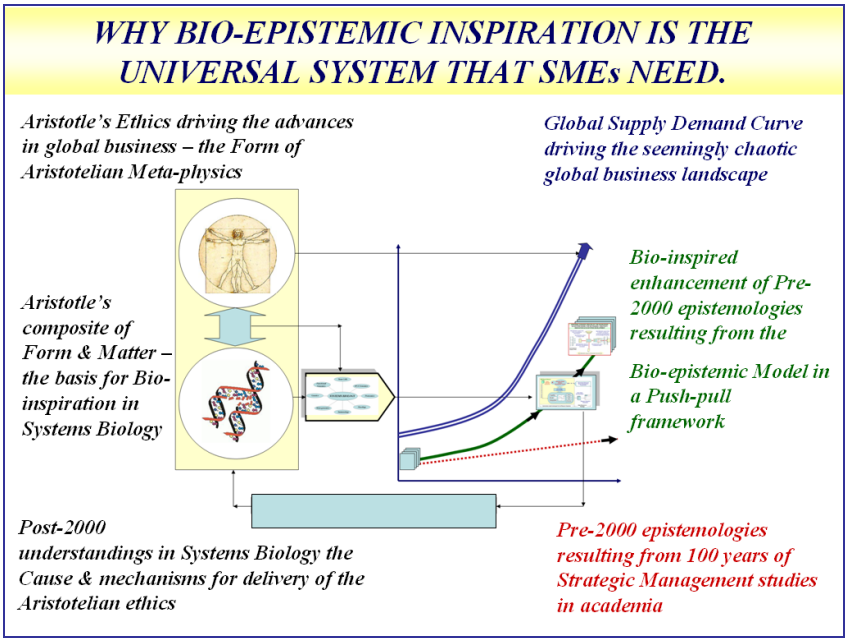

Figure 2.51 – Strategy-making potential from the Bio-epistemic spectrum to overcome Post-200 challenges and barriers

Bierly, Kessler and Christensen (2000) argue that strategy-making requires differential treatment of organizational learning, knowledge and wisdom. Quoting Albert Einstein that "Imagination is

more important than Knowledge" they explain that wisdom involves an interaction between the self and the environment. Greater knowledge of the environment and of the self makes wiser strategies possible. Ancient Chinese teachings also suggest that to be wise is to realize one's harmony with nature and to live in conjunction with nature's rhythm. To Bierly et al (2000) wisdom entails the awareness used by the self to relate successfully to the environment.

Wisdom of the Crowds as a part of the Spectrum for Strategy-Decision making

The argument for mobilizing "wisdom" into SME decision-making can be further extended by use of the concept of the "wisdom of the crowds". In its most recent form, the "wisdom of the crowds" has always been engaged by Marketing Research organisations. Called focus groups, their membership have always been used to provide feedback or analysis on marketing initiatives.

SME strategy-making could utilize the "wisdom" dimension in two ways:

(i) To guide and obtain feedback on their plans, or
(ii) To develop new business opportunities by providing a service that delivers a unique "wisdom" outcome in the package of services offered for fulfilment.

It is in this context that the web-based system illustrated in Figure 2.52 would function.

Feedback and other inputs from target representatives (Right-side of the diagram) would respond to queries or research questions presented by the central services.

In parallel the central server would continue its primary role of online selling. In both cases, the data obtained would be the information-feed-stock.

A separate server, fitted with "wisdom" application software programs would interrogate the stored data. Trends, theories, hypothesis and validity of models and perspectives would be thus obtained.

Essentially Figure 2.52 and its online infrastructure can deliver the wisdom outcomes that might be one of the outcomes of an expert-group or a Community of Practice.

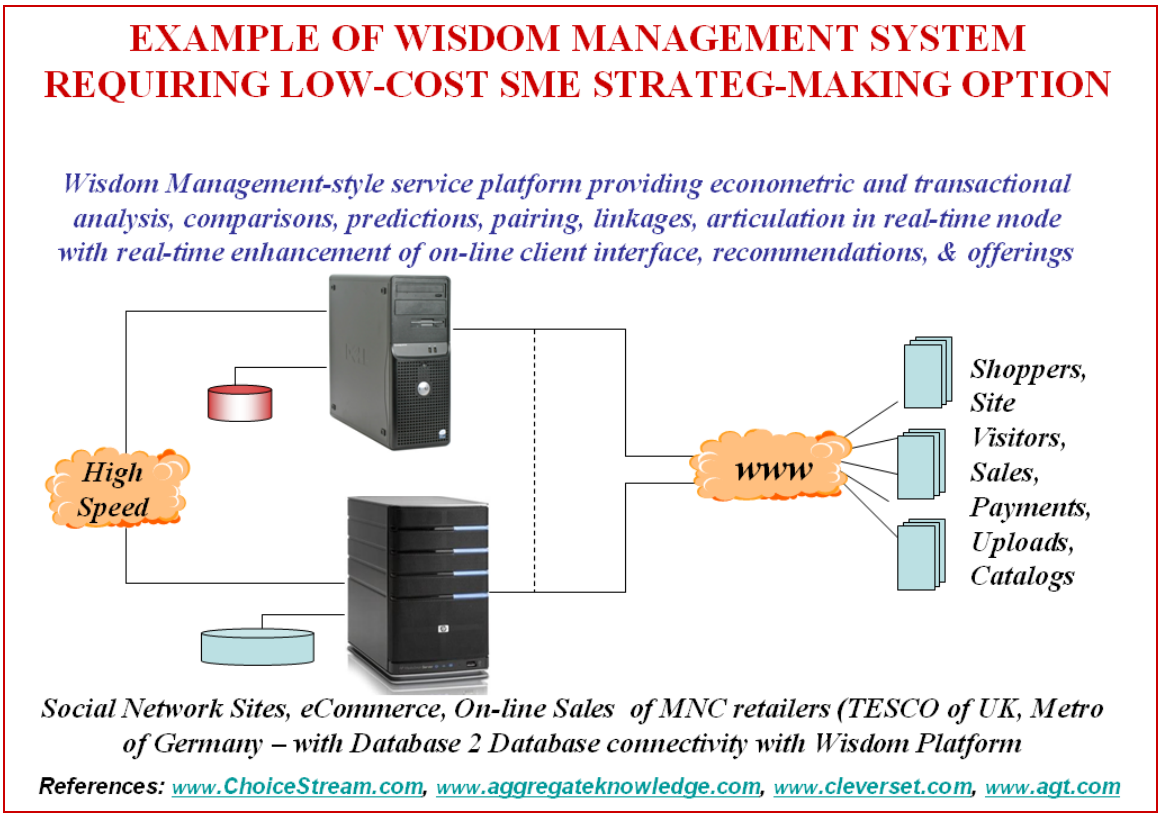

Figure 2.52 – Strategy-making lessons with Exploratory and Predictive Models

SME strategy making should note that their consideration of Knowledge Management and its different demands on learning, etc should have only one intention – to generate innovative insights on people, products, processes or packages-on-offer.

SME strategy-making needs to adapt, transform and integrate innovation in every functional activity.

Innovation: Barriers to Innovation

Reporting on the Financial Times, FT 2007 Innovation for Growth Conference
Innovation now considered:

- the new unit of competition
- the engine for growth
- an important element of organizational culture (the gravitational force that needs to bring the firm's knowledge, resources, learning together)
- direct links between innovation, knowledge and learning (learning being the pathway for knowledge capture some parts of which are converted into innovative products and services)

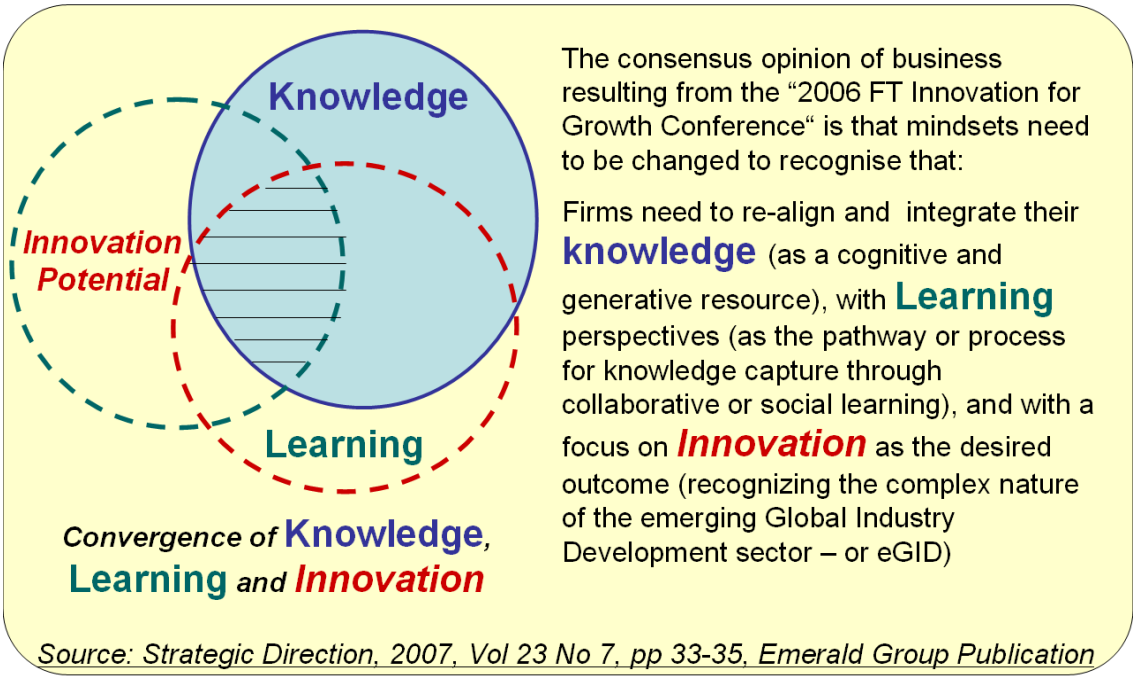

Figure 2.53 – Lessons from Schumpeter's Creative Destruction and the role for innovation

Figure 2.53 for example provides the meta-strategy for maintaining this innovation focus.

The development of pervasive and sustainable innovation is the new challenges for Knowledge Management.

Some viewpoints from the 2006 FT conference on Innovation:

- Massive change in mindset is needed
- Metrics including the targets for revenue contributions from new innovations can focus and establish the perspective for new innovation alongside sales increases from the existing product range
- Trawling of innovative ideas from supply chain partners
- A deeper understanding of the biological basis of innovation should be a priority for innovation.

Market Orientation

De Madariaga and Valor (2007) have argued for a managerial philosophy that extends the principles of innovation Customer Relationship Management to all other stakeholders. It aims to orient management's thinking and resource allocation to all stakeholders – including and beyond customers for Innovation potential identification, conceptualization, creation and co-development.

2.4.6 Nonaka Tacit and Explicit knowledge combinations

One of the break-throughs in making use of knowledge management for business strategy-making commenced with the concept of the "knowledge spiral" by Professor Nonaka in 1991.

The practical value and the practical benefits from utilizing the "SECI" model was captured by the simplicity of the concept of continued integration of explicit knowledge and tacit knowledge.

For SME strategy – making the creation of an upward spiral of knowledge from this continual mixing of tacit and explicit knowledge would make immediate sense.

The Knowledge Spiral for strategy making

In its original presentation Nonaka's "SECI" model was used to support the concept of a learning and knowledge- creating company.

As illustrated in Figure 2.54, the members in a firm commerce their knowledge-oriented actions with a certain level of "tacit" knowledge – most of it gained from "socialization" in past experiences or learning activities. In the externalisation second quadrant (Top-Right) the tacit knowledge is combined with explicit knowledge possessed and published by the firm.

The enhancement of knowledge and its value continues in the third "combination" quadrant (lower right), to be followed by internalization (left-lower quadrant). This sets up the knowledge-worker for a further round of combination thereby activating the spiral into a higher level or orbit of knowledge.

The Nonaka spiral is of particular relevance to SME strategy – making because SMEs by nature possess relatively high levels of practical knowledge which by nature is "tacit" and difficult to commercialize in isolation.

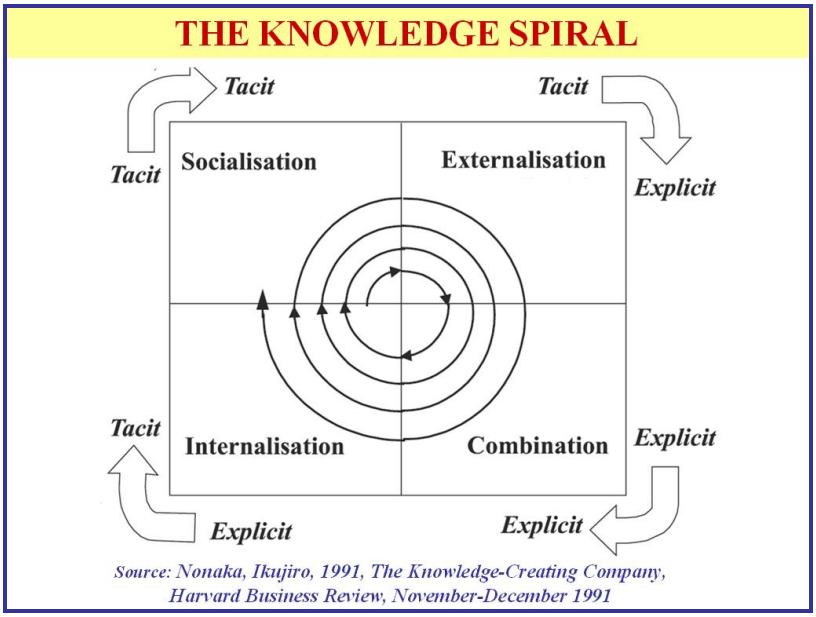

Figure 2.54 – Strategy-making lessons from the Knowledge Spiral and the integrative combination of Tacit and Explicit knowledge

2.4.7 Bio-mimicry –from Nature's Knowledge-base

For SME strategy – making the lessons of the knowledge combination extends beyond technical knowledge. Nonaka has brought into focus the power of the bio-epistemic combinations taking place in the bio-technology and the bio-medical industry sectors. In Nature's knowledge management system for example, the Nonaka combination principles take place in almost every cell or DNA gene in the human life form. The richness of the variations available in professions, creative skills, professional and technical accomplishments – are all the result of genomic combinations of the "explicit" equivalent of DNA molecule.

In Figure 2.55 for example, the sizes of the "explicit" gene (in epistemic terms) gives rise to multiple orders of variation with the simple change in a few of its information – molecule string. Nature's knowledge management system is underpinned by the combination – variation that not only assist with the development stages of the human life, but also generate the variations within and outside cultures, gender, physical activity, and exposure – response to the physical and mental environment. Bio-medical industry and their record of innovations involving regenerative medicine, stem cells, cancer treatment, and nano-scale imaging of physiological process and organs.

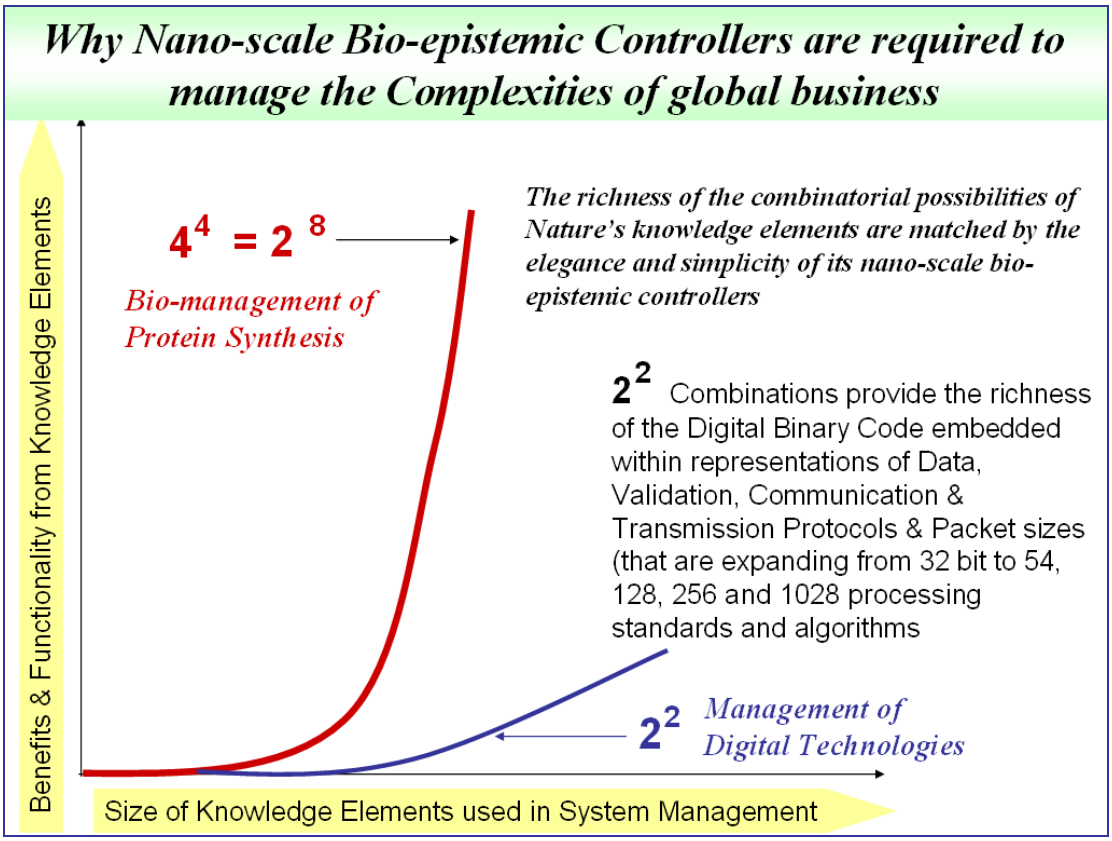

Figure 2.55 – The scope for Bio-inspiration from an epistemic viewpoint and comparison with digital technologies

2.4.7.1 Mimicry for Product Innovation

The call by Nonaka (1991) for firms to focus on knowledge-based strategy making is therefore accompanied with examples on the power of the metaphor in epistemic productivity and strategic innovation. Nonaka used his significant understanding of the knowledge management program being practiced by Japanese multi-national firms to generate and accelerate some of the most acclaimed innovations in a number of industry sectors.

2.4.7.1 Bio-mimicry – Energy Solutions from Nature's Knowledge-base

Nature's Electricity Generator is the chlorophyll in the leaves of plants. The photons of solar energy are converted into electricity that then in turn convert starch into sugars for plant growth. Research by the North Carolina State University have combined the use of the chlorophyll chemical with carbon nano-tube electrodes to extract solar power in a flexible gel like blanket.

Table 2.5 Using lessons from the Knowledge Management Domain for SME strategy-making

Lessons in strategy making from "The knowledge-creating company" by Nonaka 1991	***How knowledge management assisted strategy-making accelerated business growth and global success***
Sharp's coining of the term "Optoelectronics" which heralded the revolution of the LCD screen and the associated complementary metal oxide semiconductor (CMOS) technologies	The LCD screen technology is ubiquitous in a multiple range of product technologies – such as TV screens, Video-camera play-back, Mobile Phones, Microwaves, photocopiers, etc. Sharp's R&D managers took up the revolutionary description of the technology and used the metaphor to guide its strategy-making in a number of product sectors.
Mazda and the historic development of the rotary engine in the RX-7 sports car in 1974. Kenichi Yamamoto appealed to the mind-set of his staff with metaphors to raise their aspirations and dedication of the research teams.	The visionary and umbrella strategy-making concept was "revolutionizing" the internal combustion engine, which had changed relatively little for its original design nearly 100 years earlier. The appeal made to the R&D teams and the innovators was that they were making history – and the metaphor provided the motivation
Honda's range of new products came about from the "the Power of Dreams" and the "Lets gamble" slogan on revolutionary designs and product functionality ***Source:*** ***http://world.honda.com/history/challenge/1981city/text06/***	The slogan metaphor resulted in the Honda City's "Tall Boy" concept for vehicle, motor bike, and engine designs whose elements continue in Honda's current models, including the current "getz"
A taskforce at Canon's photocopier plant adopted the slogan of "Easy	The "Easy Maintenance" metaphor has been credited with Canon's success in

maintenance" which resulted in the in the codification of the potential problems of the working of the copier device. Using LCD screen technologies, visibility was provided on the diagnostics and recommended action – that had earlier been the job of the field maintenance technician	making its copiers available to a much wider market including small offices and even domestic home. The metaphor domesticated the copier to other Canon products including the personal copier-printer and the Fax machines.
"Human Electronics" was the slogan used by Matsushita for its consumer electronic products and the creation and development of the "micro-switch" industry sector.	The concept is credited with the successful development of VCRs, Sound Recorders, TV systems, and other consumer products under the "National Panasonic" brand – which motivated developers to focus on tasks performed by humans and developing products that used "human friendly interfaces".
The concept of "Knowledge Engineers" applying in general to the knowledge management success of Japanese firms	Nonaka credits the concept with the management of vertical and horizontal flows of knowledge and information and the maintenance of "rhythms" to synchronize the work of multiple specialist teams working on a single product

While the concept of the Nonaka combinations are simple problems exist with using the Knowledge Management systems' recommended use of strategy-making metaphors. Metaphors that suggest the need for autonomy and freedom from centralized control are viewed with suspicion by decision makers. These will need to be resolved particularly in the context of a business ecosystem.

2.4.7.2 Nature's Knowledge-base within 'Proteomes'

The potential for innovation with the bio-epistemic "Nonaka" type combinations extends to almost any industry within which SMEs may wish to innovate for eGID success.

Nature's knowledge, using its "Language of Life" code of the four information molecules produces life's building blocks – ie biologically created proteins. Within new and existing products these proteins could deliver or deter the innovative value that appeals to customers, end-users, or down-stream processes.

For example, beer as an alcoholic beverage appeals to consumers on the presence or absence of a collection of proteins. And these proteins result from the expression of genes within the yeast. Nature's knowledge management system can initiate and control the expression of these proteins. The issue of relevance for SME strategy-making is that Nature's knowledge code for such protein synthesis is being revealed in giant steps by the use of digital "DNA Chip" or DNA micro-array chips. SME could therefore obtain the DNA signatures of the desired proteins or the ores that need to be excluded. The microbiologist Righetti (2010) for example has mapped the

"customer valuing characteristics" within beer and working in nano-scale reverse engineering traced the characteristics to the active proteins and then to the protein-code in genes within the yeast cells that assist in beer processing.

The direct connection between valued characteristics to DNA signatures and possible control over the proteins holds good potential for SME strategy – making. This is because SMEs can indeed manufacture innovative versions of beverage, foods, ingredients and active Do-it-yourself "Brewing Kits" for the global market. The active ingredients from the unique fauna and flora and the clean green images of different locations would give local SMEs the advantage of delivering quality and productivity by controlling the DNA-proteome. While this control-based strategy is nano-scale and involves DNA consideration it does not involve genetic modification. Nature's knowledge management systems are simply being encouraged to be more active, rather than the modification of the DNA-sequences (the Language of Life).

2.4.7.3 Nature's nano-technology lessons in combining Proteins with industrial chemicals

Post-2000 understandings in nano-technology and the use of visualization-measurement sciences therefore confirm Nature's knowledge management as the ultimate school for material science. The lead role is provided by proteins with lessons in miniaturization, hierarchical organization, modularity, system architecture, self-organization, self-assembly and dedicated functionality. Their definitive goal in the nano-particle state is to maintain a greater harmony with the natural environment while maximizing the appeal of the active protein outcomes to end-users/ customers.

Sachez, Arribart and Giraud Guille (2005) provide an explanation of the protein variations, conjugations, and combinations with other organic and in-organic chemicals that are responsible for the hybrid innovations and the diversity within macro-molecules and in their material properties and time dependent functionality.

SME meta strategy with proteins is to deliver increased strength in mechanics and articulation, density, surface texture, deformation memory, permeability, colour, hydrophobia, immunity, anti-fouling, and reflectivity – that would appeal to end user processes or customers.

Sanchez et al (2005) argue that proteins function as the supra-molecular arbitrators of complex molecules in the form of crystals, fibres, fluids, substrates, bilayered membranes, miscelles, information signals, and catalysts. Through protein management, Nature creates "meta-molecules" that possess infinite and seamless variations in desired functions.

For SME strategy-making it is relatively easy to understand that Nature's knowledge management effectively utilizes the DNA sequence to assemble these proteins which are formed from the combination of amino-acids that are called-up or are mobilized by their DNA sequence.

In the context of the Research Project, the bio-acceleration area should be a key target area for SMEs and not just multi-national firm interest.

2.4.7.4 Bio-mimicry for product innovation – The lessons from the Amazon in South America

SMEs therefore need to evaluate the nano-scale upgrading of SME generic products and innovations. Barxil's Natura Cosmetics have shown the lead in mimicking Nature and harvesting its lessons on aroma, fragrances and skin protection creams. Lotions and creams are developed from plant extracts and admixed with palm oil derivatives to provide a natural alternative to the use of animal fats. The unique benefits to its end-users are the result of the unique plant metabolisms in the native environment of the Amazon rainforests. According to Sirkin, Hemerling and Battacharya 2009 the application of bio-mimicry and lessons from nature have transformed this 1996 start-up firm into a global corporation which has in turn re-configured the global cosmetics industry and the strategies of its earlier business leaders such as Unilever, Avon and L'Oriel.

Nano-scale upgrading with proteome-focused services are being increasingly offered to wider groups of end-users, not just multi-national corporations. SMEs need to consider using this new resource for eGID participation.

2.4.8 Boisot I-space

The Boisot-I-space concept presented by Professor Boisot (1998) of Cambridge University offers a practical tool for SME strategy-making considerations. Boisot offers a 3-dimentional construct in the form of a 3-axis managed prism as a tool for firms to better manage the Information Economy. While the Post-2000 era has gone past the Information era to one of commoditized knowledge and wisdom, the I-space framework is still valid and relatively easy for SME strategy-making.

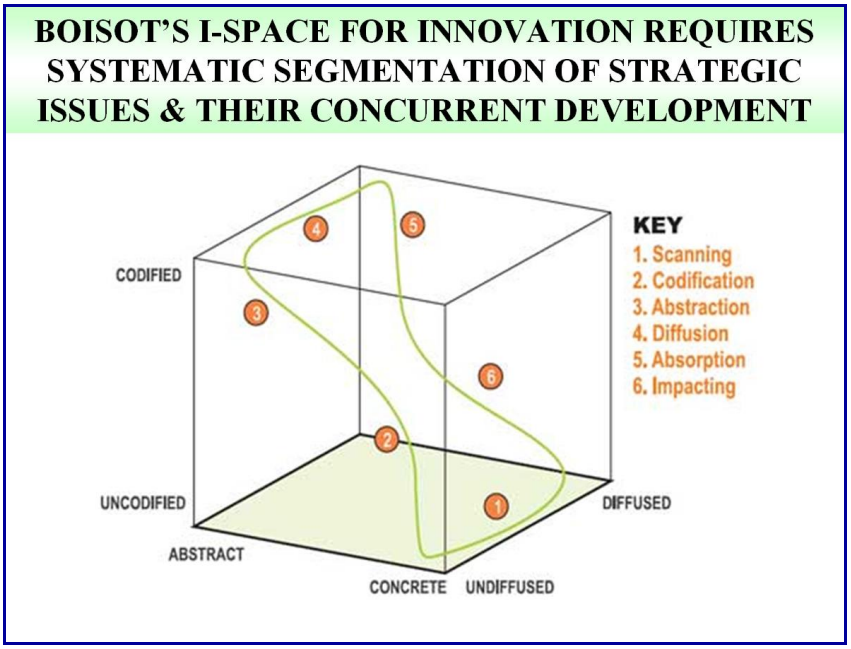

Figure 2.56 – Boisot I-space offering lessons for strategic positioning for Innovation in the Information Economy

In Figure 2.56 for example the cube consists of:

X-axis – the scale of "Diffusion" of knowledge that may be embedded in products, services, or other offerings from a developer or manufacturer.

Y-axis – the scale of "Codification" of knowledge required to be embedded within or an active requirement in its production. The codification domain directly relates to the "Explicit" knowledge regime of the Nonaka knowledge spiral. In most cases, the codification domain is also the result of public domain knowledge, regulations, standards, best-practice, etc.

Z-axis – the scale of "Abstraction" by which the embedded knowledge is managed through direct identification with its values, functionalities, conditions of state, or cognitive relationships or active connections with the mind of emotions of the end-user/ customer-buyer.
SMEs wishing to use the Boisot I-space need to aim for the highest levels of knowledge combination in their Codified, Abstracted and Disseminated form within their target products or services. From a strategy-making viewpoint, SMEs need to elevate and mobilize their knowledge, at least to the maximum of "X-Z" axis intersection or coordinate. Epistemic positioning at this X-Z coordinate is best suited for maximized innovation potential. Boisot offers advice and argument on how to reach this optimal spot through the "Social Learning Curve" of continual knowledge aggregation.

As illustrated in Figure 2.56, to reach the optimal point indicated in spot 3 (the top-left corner of the prism) firms will need to go through the Learning curve achievable from:

1. Scanning of the epistemic landscape

2. Codifying the technologies or the processes that generate/ manufacture/ fabricate the product

3. Abstracting the psychological cognitive, emotional spatial, or temporal relationships that would be created or established by the knowledge to be codified and embedded within or codified knowledge required for its production, delivery or utilization

4. Diffusing the knowledge captured, embedded within or controlling the product-service through innovation in commercial modes of fulfilment

5. Absorbing the feedback obtainable from the end-user experiences, so that the learning cycle can be renewed, and

6. Impacting the entire epistemic level or orbit of the I-space by continuous adaption/ enhancement/ upgrading of the codified/ abstracted/ diffused knowledge-aggregate.

In its most simple message for SME – strategy-making, the I-space offers the target spot that SMEs should be positioned for maximal innovation generation.

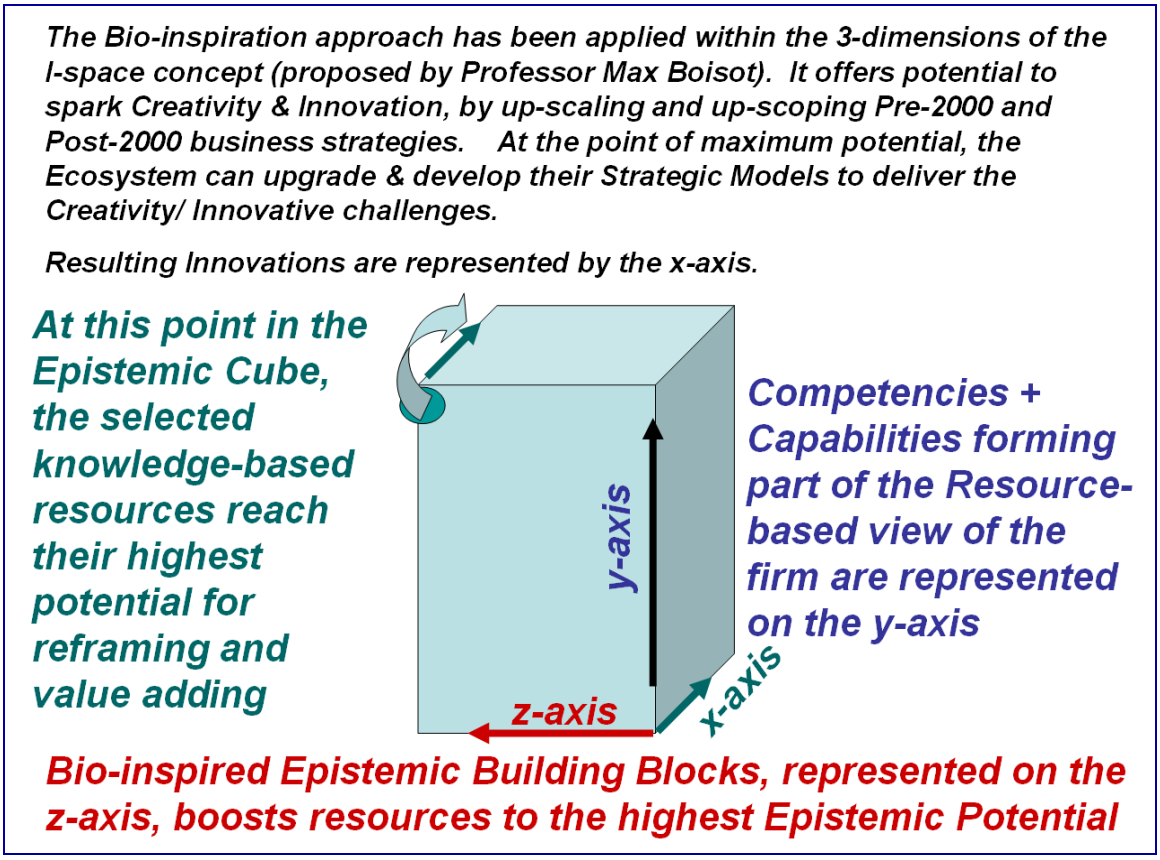

Figure 2. 57 – Optimum strategic positioning for SMEs to generate and launch innovations

In Figure 2.57 for example SMEs would be generally well capable of codifying their knowledge (Y-axis). Similarly they would be aware of the "Dissemination of Diffusion" landscape (X-axis).

The knowledge-gap however resides in the Z-axis, the requirement to de-construct and "abstract" the inner-values of their products/ services/ systems offered.

Figure 2.58 therefore illustrates the need for a strategic pathway that SMEs need to create and/or negotiate – either alone, with strategic alliance partners, or with the membership of their business ecosystem.

The target pathway can be illustrated (per Figure 2.58) as the necessary series of "learning steps" gained from aggregated knowledge and feedback.

In epistemic terms, the growth pathway along the Y-Z axis of Figure 2.58 can also be considered as a "Demand-side" evaluation of the valve offered by planned innovations from or SME-strategy-making perspective.

Realizing that the best launch spot for innovation is at the maximum Y,X coordinate, SMEs need to focus their scenario- planning skills on the required learning or resource development targets.

Once SMEs make decision on the epistemic position of the target Y,Z coordinate – and only then – should the "supply-side" factors or the Diffusion – Dissemination take full control.

This is a staged-approach to the management of I-space strategy-making that could save SMEs significant amount of time and resources in their innovation development and eGID objectives.

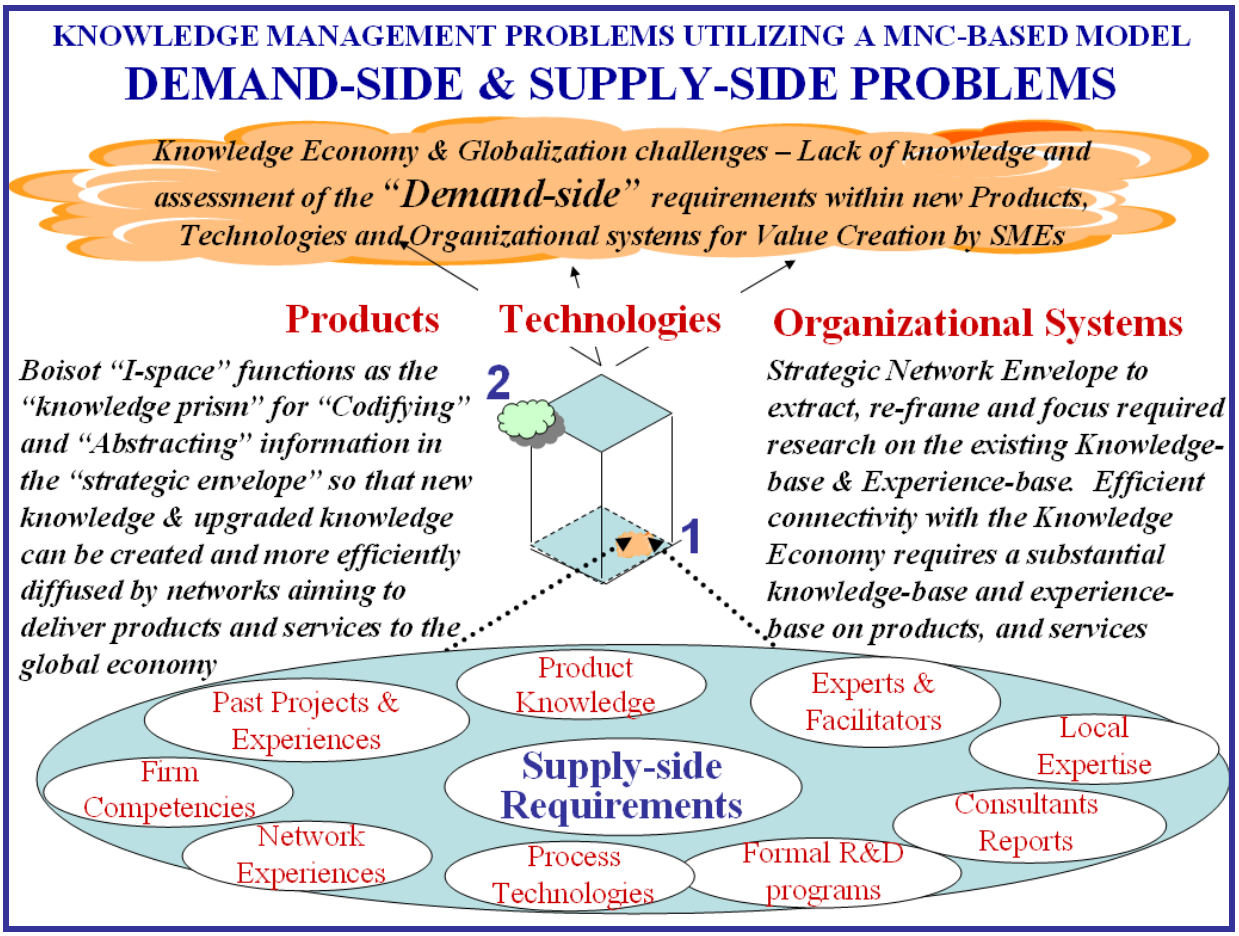

Figure 2.58 Strategic approach to manage and balance Supply-side and Demand-side issues with a dedicated Business Ecosystem

Figure 2.59 presents the ease for extending the I-space guided strategy-making processes to include SME-established business ecosystems.

The case can be made that ecosystems are an effective mechanism for growth of the I-space-based positioning for innovation and eGID participation.

The SME-established ecosystem would essentially be the "Unit of Analysis" for the creation of the maximal (Y, Z) coordinate by aggregating knowledge possessed by ecosystem membership in the areas of codified and abstracted representations of the customer value propositions.

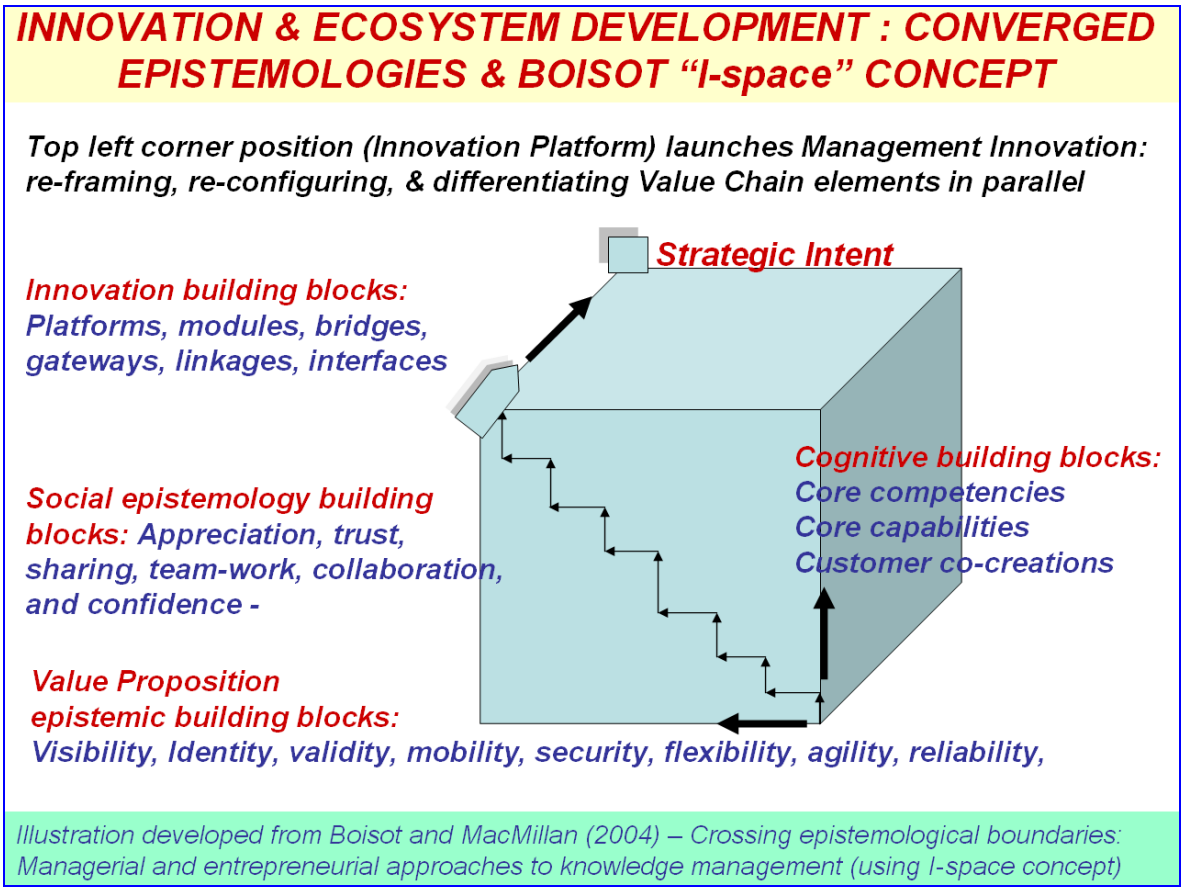

Figure 2.59 – The strategy justifying knowledge aggregation from business ecosystem membership

2.4.9 Appreciative Inquiry

SME strategy-making needs to be aware of the scope and potential for innovative and eGID participation that can be facilitated by their deployment and management of the "Appreciative Inquiry" protocol or ecosystem-team building perspective.

Pioneering research by Cooperiders and Shruwastava (Bushe – 2011, Whitney and Trosten-Bloom – 2010, and Eganand Lancaster - 2005,) at Case Western University have presented the strong case for the use of Appreciative Inquiry's guidance factors and its in-built motivational value to transform knowledge and develop Post-2000 EGI strategies with a focus on leveraging positive thinking within the business ecosystem.

As illustrated in Figure 2.60, the Appreciative Inquiry process recommends that the managers of a team building exercise (SME strategy-making for example) focus their attention on 4-stages of mobilizing the minds, emotions and commitments to the target objectives.

The 4-stages of Appreciative Inquiry consist of:

1. Discovery – where the positive success stories of the team membership are recalled in a formal manner. The state provides recognition and acknowledgment of the existing and future contributions that each of these team member can be expected to make the objectives on hand.
2. The Dream stage – is more the reflection of the successes but which goes beyond the "If only.... wishful thinking and dreaming". Instead it requires analysis of the past successes recorded or presented by team members. It can define and characterise the future contributions to the team or the business ecosystem.
   The reflection – analysis would also "link" the past successes to the potential for re-use or aggregation of the past successes or expertise. The Dreaming – analysis stage could also be mapped on the Boisot I-space. Abstracted or codified knowledge can be aggregated on the "Demand-side" of the I-space and the Innovation generating (Y,Z) coordinate achieved with a greater chance of success.

3. The design stage of the Appreciative Inquiry sessions are more firmly linked to the corporate and ecosystem strategies and target benefits with the growth of the Boisot I-space Y,Z innovation launch point coordinate.

4. The Destination session is directly connected with "Supply-side" considerations. The physical supply-chain pipeline and its innovative embedded knowledge are the focus during this session.

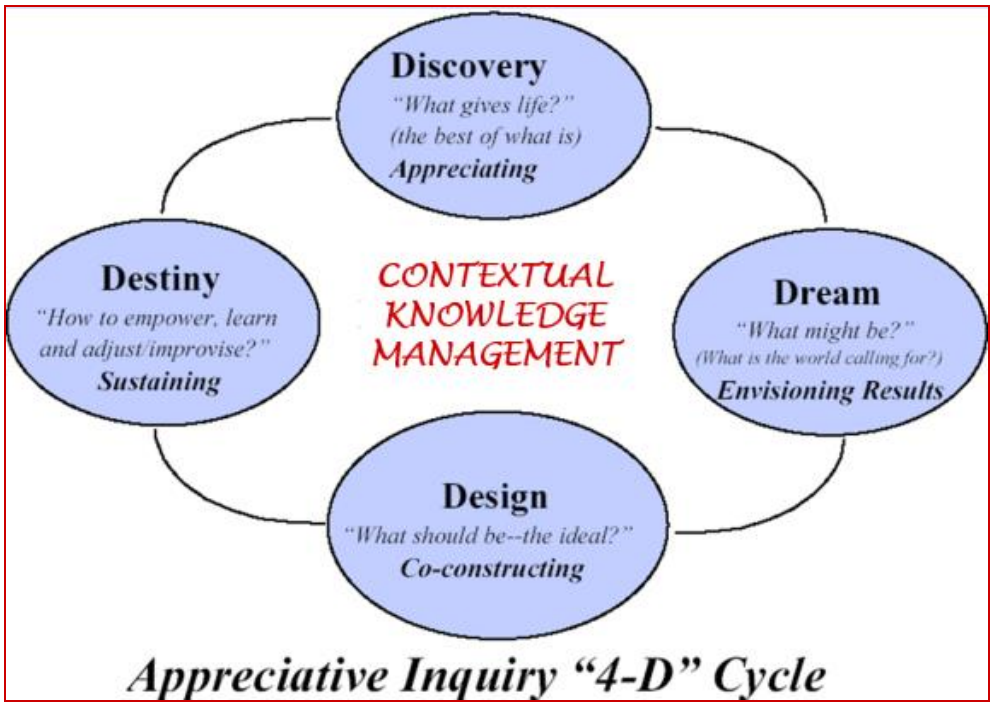

Figure 2.60 – The physical processes and stages of the Appreciative Inquiry and its 4D cycle

The underlying factors that create value through the Appreciative Inquiry protocol are the mobilization of the "minds" of the participants and the moderator/ developer.

As illustrated in Figure 2.61, the target is to achieve break-through type thinking for innovation generation. In the context of Figure 2.61, the Appreciative Inquiry offers the potential to break-

out of conventional "Command – and Control" approaches to business ecosystem-related strategy-making (for example).
The epistemic "break-out" is exactly the type of outcome needed by SMEs for innovation and success in eGID.

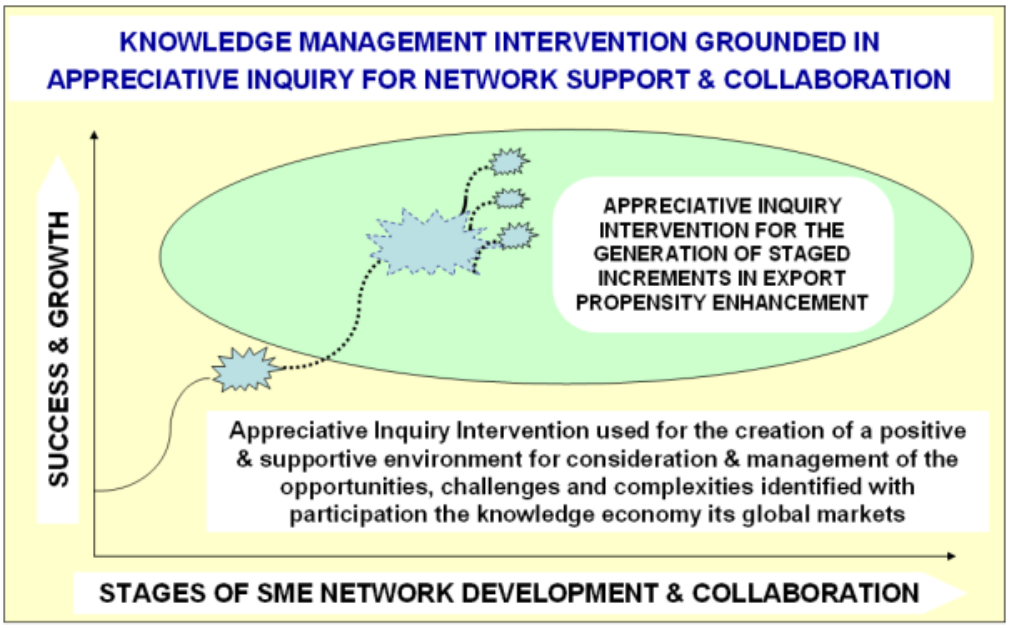

Figure 2.61 – Strategic context justifying the application of the Appreciative Inquiry approach to innovation development

The challenge in the Knowledge Management frameworks (acknowledged by Oshri, Pan and Newell 2006) is that no recognized process exists for the capture and sharing knowledge among potential and existing ecosystem members. Nonaka's work on integrating tacit and explicit knowledge in order to achieve the knowledge spiral has highlighted the importance of tacit knowledge. Without this category of knowledge within the strategy-making mix, it is virtually important for the generated strategy to maintain relevance and longevity.

The concept of the Appreciative Inquiry process has been developed quite independently and from a totally different perspective. Srinivasan and Cooperrider of Case Western Universityhave argued that knowledge sharing can only be achieved from willing contributors. In their "4-D" cycle which defines the Appreciative Inquiry process, it should be the mind of team members making up functional groups that need to be mobilised in 4- stages of cooperation and joint development of solutions.

In the context of Figure 2.62 for example, the SME moderator would focus on creating generative and transformative strategies that are required to close the knowledge gap preventing eGID success. Planned Business Models could be presented for the:

(i) Discovering stage where business ecosystem team members are mentally encouraged and motivated to disclose their past successes and effectively offer their expertise in the context of the successes achieved

(ii) Dreaming stage where business ecosystem team members are encouraged to extend their mental visualizations and mindsets to the continuation of the past successes, in the new context being demanded of the team

(iii) Designing stage where the business ecosystem team membership is encouraged to formalize and structure their "dreams" and past successes into the corporate vehicles and constructs that are under consideration, and

(iv) Delivering stage, or fulfilment stage, where the end-results and the integrated benefits of the collective efforts are harvested for corporate development.

The dominated factor in the Appreciative Inquiry process is the harvesting of its potential to achieve "Transformative and Generative" thinking. Importantly Cooperider and Sriwastawa production of their 4-D cycle was conceived in the background of their academic experience as industrial psychologists. This further explains why SME-strategy making does indeed need to mobilize concepts and resources that are traditionally outside of the gambit of business education.

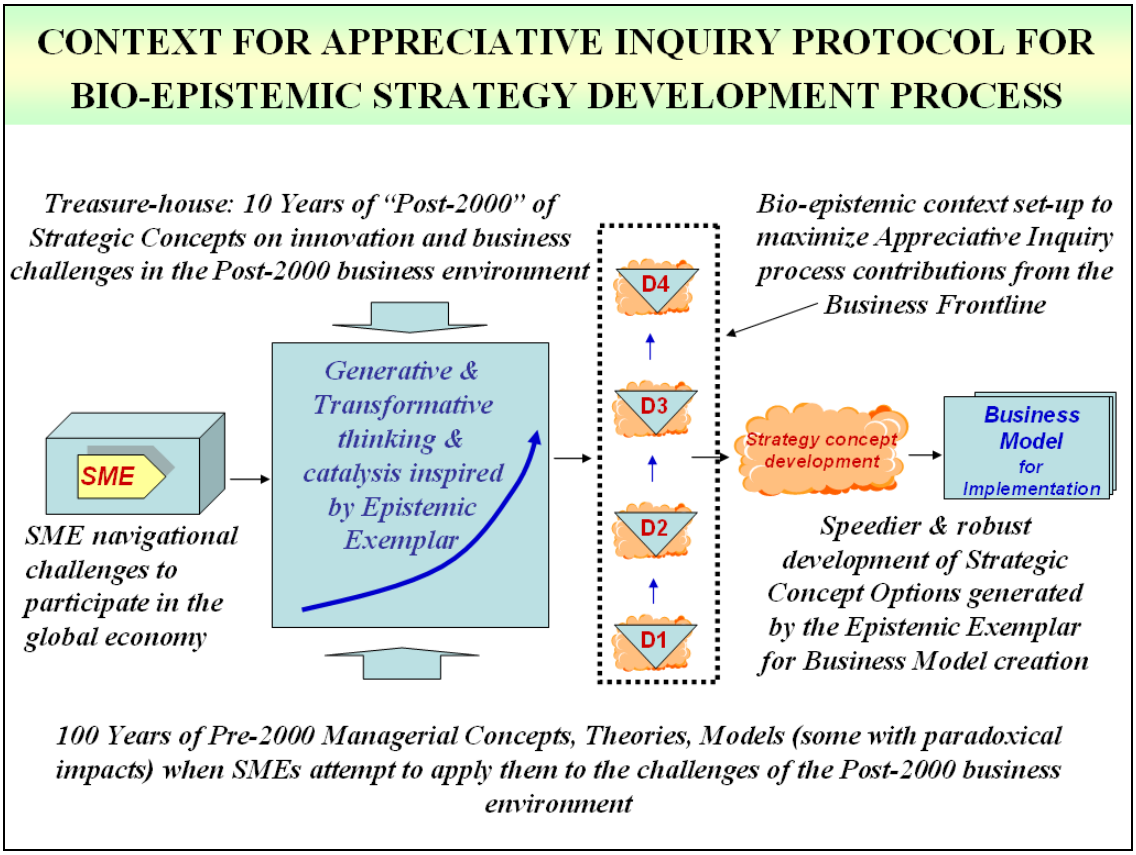

Figure 2.62 – Direct application of the Appreciative Inquiry concept for generative and transformative thinking in strategy-making

2.4.10 The epistemic case for metaphors and parallels

The nano-scale perspective of business operations and the multiple derivations of the Porter Value Chain, etc confirm the need for the aggregation of minute operations of identification, acquisition, addition, duplication, integration, combination, clarification, presentation, exchange, validation.

A further resource for SME strategy-making that transcends these concepts and model-derivatives is the use of the "Minds" use of tools such as Metaphors, similies, parallels, analogies, and inspirational and mimicry deployments.

The key driving factor is that these tools and knowledge development catalysts should be used in a structured manner. For example the Appreciative Inquiry process could utilize the learning structure of the Blooms Taxonomy.

The Blooms Taxonomy in Learning and the stages of development with higher order thinking, in order to deliver cognitive thought advancement and innovations – advancing progressively from stage to stage, ie. from awareness, comprehension, application, analysis, synthesis, evaluation and finally re-staging the cycle with creativity as the new starting block

2.4.11 The Fifth Discipline

The need for a learning methodology exists with all firms operating in the global economy. The learning methodology proposed by MIT Professor Peter Senge (2006) offers a structured approach that specifically caters to the needs of Post-2000 business. The business and technical qualifications of Professor Senge and the technological pre-eminence of the MIT university setting have together enabled the development of a learning framework which moves away from the traditional approaches to narrow discipline limited learning. The learning methodology stresses the need to advance both on a personal level and in a group – each with their guides on Personal Mastery, Mental Model development within the individual and Shared Visions and Team learning for the group.

The art and practice of the Learning Organization

Figure 2.63 – Strategy-making and learning from the concept of the Learning organization and the Fifth Discipline

Figure 2.63 illustrates the requirements for firms wishing to participate in the knowledge economy. Professor Peter Senge of MIT originally published this treatise in 1996 to explain how firms need to transform themselves from their transactional type focus on managing knowledge to a more systematic and holistic approach so that a better corporate response could be developed. Senge (2006) assigned the "Systems Thinking" requirement as the "fifth" discipline and integrator of the learning that must be achieved by firms.

The distinct advantage of the Senge Learning Methodology is its universal appeal – irrespective of the size of the firm. Although corporate target of the "The Discipline" is aimed at the large Nulti-National Corporation (MNC) its lessons have universal corporate appeal especially in the Post-2000 business landscape.

2.4.12 Nano-scale controllers

It is clear that a control system must exist to bring together and enhance the interacting factors that characterise any business operation in its quest to participate in the global business economy. Deep within the epistemic landscape of business there must reside an epistemic system that provides the finer control over the generic knowledge and the general capabilities of firms and business entities and the ragne of business models and concepts that have evolved over the past 100 years (ie, the Pre- and Post-2000 strategy-making building blocks). Theirs epistemic controllers must provide the finer controls and the integration mechanisms and the transformation systems as illustrated in Figure 2.64.

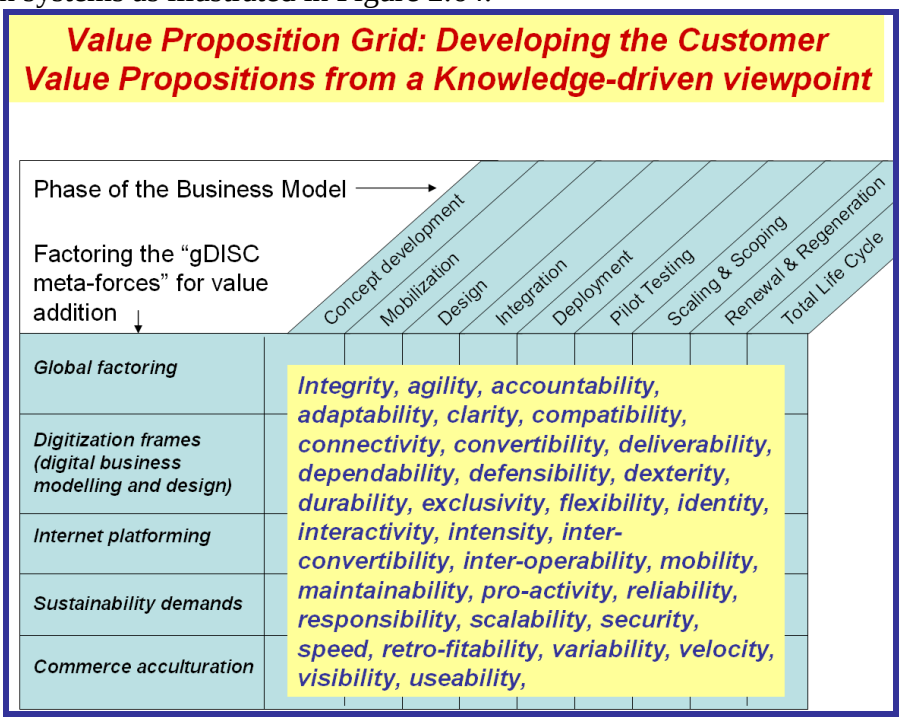

Figure 2.64 – The use of the Value Proposition Grid for strategy-making from a Knowledge Management viewpoint

Figure 2.64 illustrates the epistemic landscape and the need for convergence of issues from a knowledge viewpoint. The matrix brings together the impacts of globalization in combination with the development of business models, and the role of nano-scale controllers. In the middle of the grid of Figure 2.64 are listed a portfolio of characteristics or conditions of state, or dynamic descriptors that need SME strategy-making consideration.

From a knowledge management perspective these defining characteristics/ conditions of state/ descriptors offer valuable epistemic bridges for one of the most different to conceive segments of the Boisot I-space. Equally these defining concepts are of great value in characterizing the concepts and the communication exchanges between the participants of the Appreciative Inquiry protocols.

The epistemic factors in the grid of Figure 2.64 are equally important to Pre-2000 and Post-2000 business models, their concepts and the understanding of their assumptions and success factors.

2.4.13 Bio-inspiration from Nature's Knowledge Management System

It is in the context of the controlling factors of Figure 2.64 that an introduction of the concept of "Bio-Inspiration" is provided in this Literature Review.

The 21st. century is the Biology Century

Leading academics and scientifically qualified futurists have predicted that the 21st. century will be the Century of Biology. It will deliver new understandings in knowledge, business, lifestyle, resource development, and sustainability of planet-earth itself. The Research Project found it necessary to recognize the challenges and opportunities offered by 21st. century Biology. The Project was able to expand the knowledge and wisdom of resolving the 100 year $1 Trillion challenge by this attempt to mobilize the new understandings in Post-2000 Systems Biology. Specifically it was necessary to benefit from the epistemic lessons available from the neurobiology of behavioral psychology as the key platform for bringing together the inputs needed for a transformation model. The project has been able to combine the epistemic perspectives from neurobiology with the epistemic protocols and concepts used in molecular and cellular biology, in behavioral psychology, and in business strategy studies. As a result the new catalytic approaches and its recommendations are grounded in the cutting edge science of Post-2000 Systems Biology. Although just at the very starting point, this research has the potential to establish a renaissance in business strategy-making through a new line of academic intervention.
Professor Freeman Dyson's prediction that the 21st. century will be the Century of Biology. The 20th. Century was the Century of Physics with nuclear power, and atomic physics including Quantum Mechanics and the digital revolution.
Already the level of resources expended in bio-tech research exceeds the research in funding of the disciplines of physics

21st century is the Biology Century for strategy-making controllers.

Quote *"Technology is a gift of God. After the gift of life it is perhaps the greatest of God's gifts. It is the mother of civilizations, of arts and of sciences. — Freeman Dyson*

Infinite in All Directions: Gifford lectures given at Aberdeen, Scotland (2004), 270" End quote.

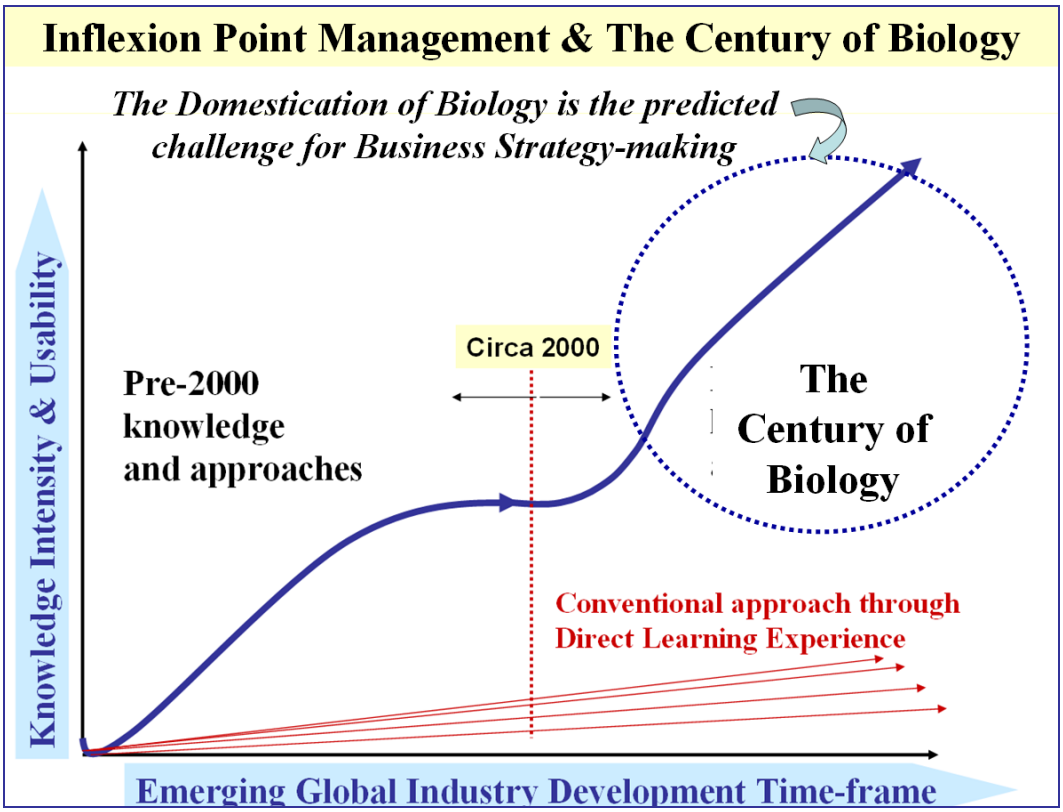

Figure 2.65 – Strategy-making lessons in the context of the Freeman Dyson's Century of Biology

The justification for the dominance of biology extends beyond the economic fact that more research funds are being invested in the biology discipline that any other including physics or chemistry. Professor Dyson's observations are credible because they cover more than 50 years of research in the fields of mathematics, quantum mechanics, solid-state physics, ferro-magnetism, nuclear science, and astro-physics.

The Dyson message is that the benefits of this massive discipline will be manifested within the smallest and the most "common-life-isses" of applications. Dyson terms this the "domestication of biology" just as the computer world eventually became domesticated. It can be argued that to ignore his advice on the importance and domestication of biology would be to ignore major factors and major systems at work within the dynamics of the emerging Global Industry Development sector (eGID) and the required SME strategy-making considerations.

For example, Professor Dyson has predicted that it is logical for "biological engineering" to emerge that once domesticated can transform the conditions of mankind's existence on the planet. According to Professor Dyson, the IT industry will aim to imitate the information-generating functions of DNA, and miniature factories will imitate the production systems of protein synthesis that takes place in the cell, within which the DNA is a central system.

Dyson's foresight is amazing because several of Professor Dyson's predictions are taking place in reality, just a decade later. His prediction that a complete understanding of the principles of

organization and development of a simple multi-cellular organism can provide humans with the secrets that have evaded our earlier quests, including our understandings of the approaches needed in Post-2000 business strategy making.

The lessons from this distinguished scientist, technologist and educator is that strategy-making too should look towards the science of biology for lessons and benefits that no other technology can offer. It can be further argued that the concept of bio-mimicry bio-inspiration and bio-emulation should be investigated to determine if any potential exists for a contribution to strategy making.

Professor Dyson observes that it took "three generations of misery" for the lessons of the industrial revolution of harvesting the benefits of coal and iron utilization. By contrast Professor Dyson observes that the technology of micro-chips and computer software have largely been achieved within a single generation. Following this logic, the predicted benefits of his "Biology Century" cannot be ignored.

It is in the context of Figure 2.65 and 2.66 that SME strategy-making needs to review the Post-2000 sector. Bio-medical industry and their record of innovations involving regenerative medicine, stem cells, cancer treatment, and nano-scale imaging of physiological process and organs are indeed proof of the use and harvesting potential with Nature's knowledge management system.

SME strategy-making however needs to review the issues of Nature's knowledge management system if it is participate in the benefits and opportunities of the century of biology. In this context, SMEs need to condition their mindsets to the fact that Nature's language of knowledge and its language of life are both the same. Both use the sequence of the arrangements of the 4 DNA – genomic – information molecules (represented by the letters A, G, T, C) to generate content, commands, and control.

The "Content" formed from A, G, T, C sequences and arrangements through a series of dynamic interchanges, exchanges, integration, and checks, etc are finally manifested in the form of knowledge of concepts, models, insights, controlling factors, assumptions, etc. In Figure 2.66 therefore the "Information Tsunami" and the 100 years of knowledge (illustrated in the centre portion of the diagram are nothing other than macro- and supra- aggregated manifestations of the original A, G, T, C combinations.

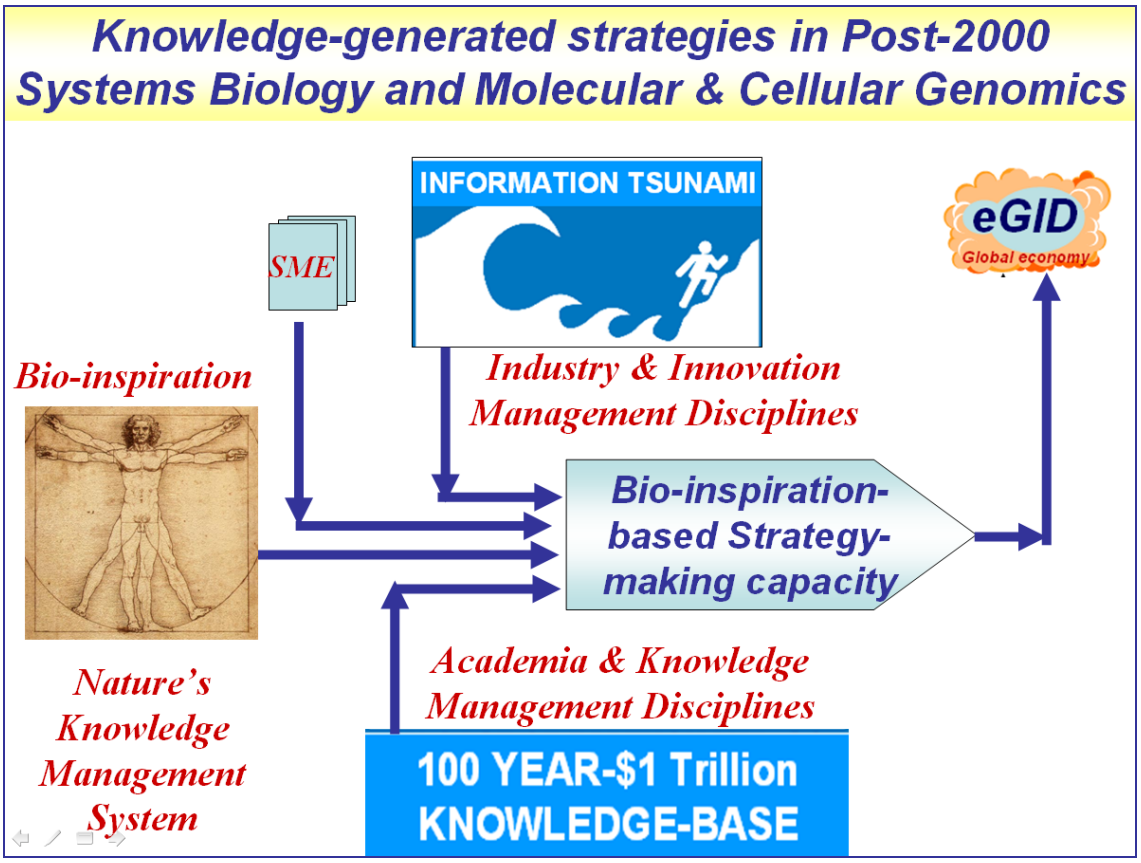

Figure 2.66 – Strategy-making lessons from Systems Biology and Molecular and Cellular Genomics

Referring again to Figure 2.66, SMEs need to recognise that with this common genomic – information – DNA molecule heritage, the pathways to knowledge creation and advancement are biologically controlled. In the Post-2000 era, the new scientific domain of systems biology argues and presents scientifically verifiable proof (from X-ray crystallography) and fMRI brain scans) that it is the biological-mediated integration of DNA-molecule- knowledge elements that generate the innovative creations of the human life form.

Strategy- making is but a tiny sub-set of the range of human- knowledge expression and manifestations. Again in the context of Figure 2.66, it can therefore be argued that "Bio-inspiration" (shown in the far left of the drawing) should be accepted as a valid input into the strategy making process. While this statement could apply to almost all human endeavours and aspirations, the relationship for SME strategy-making derives from the need to manage the required cognitive, emotional, historic (memory) and learning systems within the SME and the business ecosystem. The representation of the global economy's challenges (eGID in the top right of the diagram) is similarly composed of the multiple and meta/ supreme/ ultra combinations of human through generated by the originating genomic – DNA – information molecules.

To SMEs the "Bio-inspiration" or its sub-sets such as bio-metaphors, similies, mimicry, etc should be given priority thought together with the Post-2000 scientific truth that all knowledge,

all wisdom, all expertise can indeed be traced to the sequences or patterns in which the DNA-information molecules are arranged.

To accept this mindset-changing fact SMEs need to view:

(i) The portfolio of Pre-2000 and Post-2000 knowledge as a sequence of DNA/ information molecule elements

(ii) The DNA – information molecules sequences create patterns in mega, meta, supra, and ultra- combinations

(iii) These patterns are subject to change by the addition/ extraction/ or intervention of other knowledge – pattern elements

(iv) The dynamics of the pattern-to-pattern DNA information molecule exchanges result in the creation of all thought and the creation of innovative constructs, and

(v) The "Mind" first explained by the classical Greek civilization and Aristotle is the Controller/ Initiator/ Catalyst/ Terminator/ Accelerator/ storage system of such pattern-on-pattern interactions of the DNA-information molecules.

Bio-inspired lessons from "Pattern-on-Pattern" digital convergence and parallel DNA – information molecule dynamics.

The electronic bar-code that is affixed to consumer goods was made popular by the Walmart company in the 1950s. A barcode is assigned to each SKU (Stock Keeping Unit). Essentially a pattern of binary number (0 and 1) are made to represent that SKU, based on the sequence of the two digits. In the Pre-2000 ear, the Electronic Bar-code has been credited with massive productivity increases, profitability, standardization, and "commodification" of a vitally important representation system. It is currently the main system for identifying all goods being purchased from retail outlets, or for tracking and settlement on the upstream logistics chain.

Post-2000 consumer electronics and digital convergence offer lessons in strategic thinking and the role of knowledge for SME strategy-making. The use of similarly embedded digital data within the Quick Response codes (or QR codes) makes for greater use with the convergence of technologies through popular phone "Apps" programs. A phone set for scan mode can read the abridged QR "bar-codes" for data acquisition, automated connectivity, and delivery of consumer interest and feed-back..

The lesson for SME strategy-making is the chain of events or transactions that ensure when a QR code is accessed. Its electronic signature of 0s and 1s is uploaded to an online server. Here the "Pattern" of the scanned SKU now functions as the primary key to extract embedded information that has been pre-recorded within the online database system. The database can be populated with historia or time-sensitive "information" that has a commercial, transactional, financial, value delivery, or social interest to the scanner who may initially have scanned the original SKU's QR code. Smart-serverl responses, mediated by digital convergence can deliver lists, recommendations, contact details, product specifications, etc.

The target recipients or the services of suppliers of the physical goods (represented by the original SKU pattern) can then be traced and or published. The potential buyers or end users of the presented knowledge or information (illustrated on the right of the diagram) could offer a range of service, viz:

- Product information for decision making related to desired consumer behaviour requirements
- Online sales ready conditions for the mobile communication platform
- Recommendation or comparisons of products, price, availability, nearest location, etc. Or
- Recruitment to join groups of commercial or social interaction.

Integration of such Pre-2000 and Post-2000 innovation can indeed be utilized by SMEs in their local "IR-grids" positions. It is common practice for some Real Estate Agents in Japan and the USA (for example) to affix a "Bar-code" to the advertising boards at the front of houses for sale. Prospective buyers need to simply use their smart phone to scan the "Bar-code" of the advertised house. The scanned pattern submitted online their generates and delivers the full portfolio of details on the home for sale. Finally it should be noted that this Pre-2000 integration and innovation is made possible by the use of the web and its internet technologies in the Cloud.

Nature's Bio-markers and Pattern Generators and their role in Knowledge Convergence

What Pre-2000 Strategic studies have neglected to leverage is the fact that Nature has developed and utilized its own QR-bio-code equivalents, with far greater scale, scope, sensitivity, and differentiation. In fact Nature's QR Bio-code is but a tiny sub-set of the Immune System that protects all human life.

Nature's Immune system uses Biological Tags, Bio-markers, and Nano-scale proteomic signatures, etc to attack or permit the functioning of cells in the different organs of humans. Nature's Immunoligical mechanisms are both innate and developed through external intervention such as by vaccinations and inoculations. The net effect is that Nature uses a Bio-information system as the refernce, the controller and the initiatora and the terminator of associated biological delivery mechanisms. Figure 2.67 seeks to illustrate how Nature's innate or basic knowledge is sharpened and honed by the portfolio of bio-marketrs and bio-signatures.

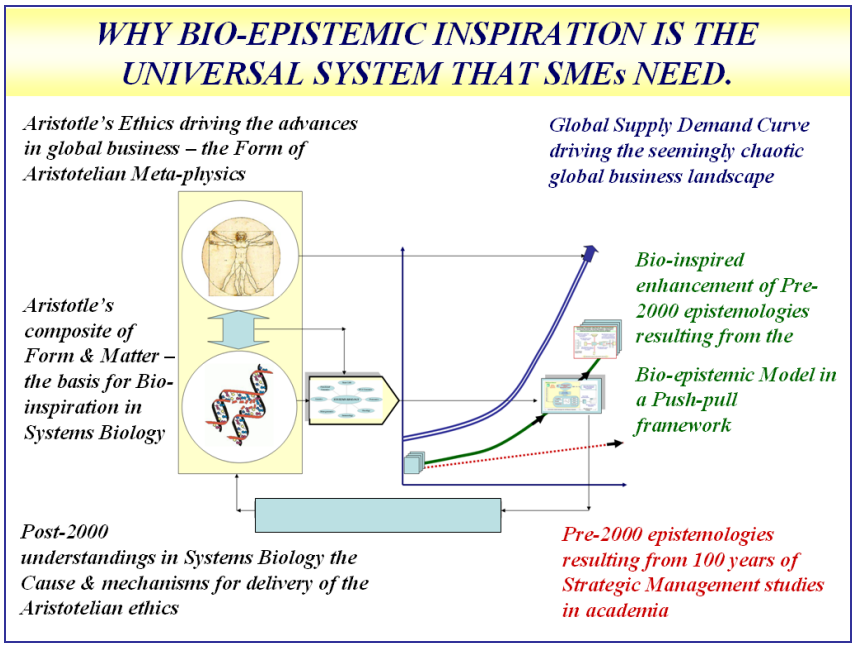

Figure 2.67 – Bio-epistemic inspiration and its relationship to the management of the Knowledge Gap

Nature's lessons on Push-pull mechanisms to enhance the usability of a knowledge-base should therefore be presented for SME strategy-making efforts. Popular use and mechanisms of the QR "Bar-code" scanning mechanisms and the resulting downstream activities generated by digital convergence ned to be studied in grater detail.

The Bio-epistemic lessons from Nature's Push-pull transformation and creation of new knowledge:

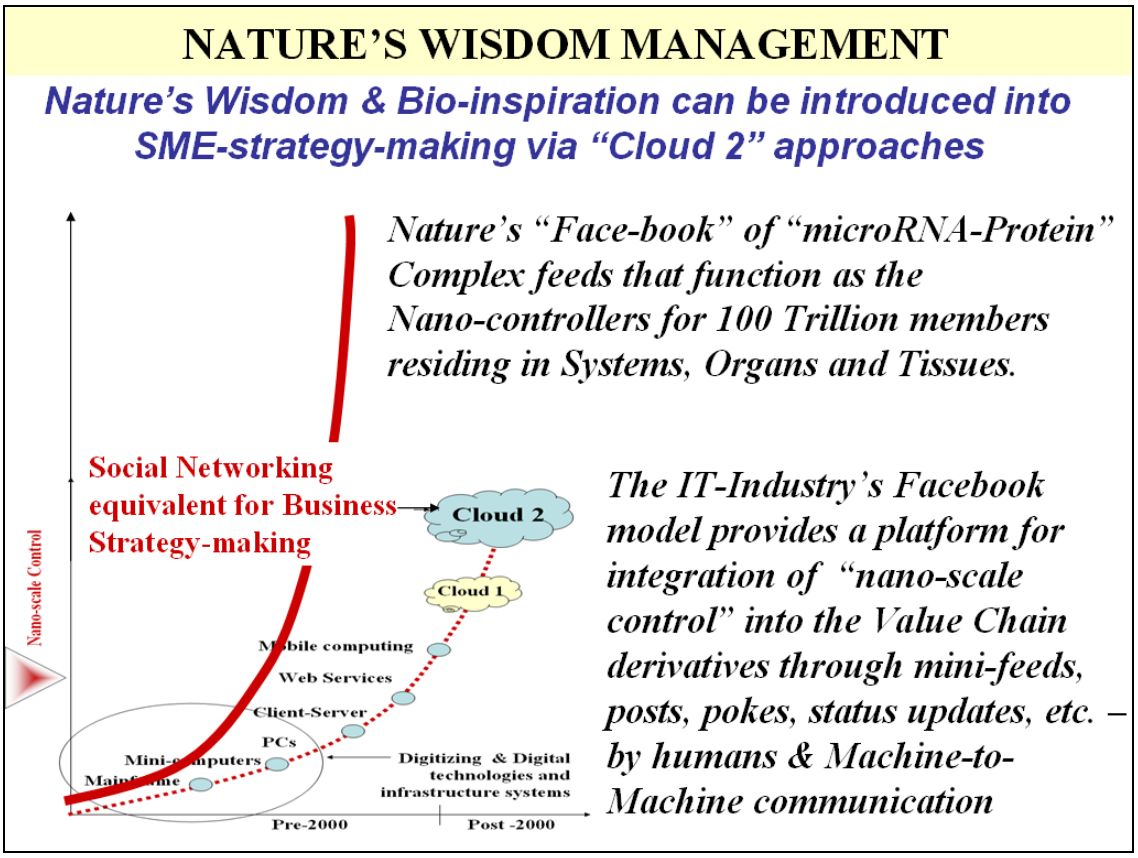

Figure 2.68 The landscape for Bio-epistemic inspiration and its relationship to the Digital Information Economy

The case for extracting and harvesting lessons for SME strategy-making in the Post-2000 era can be presented in the context of Figure 2.68. Nature's Bio-marker systems demonstrate how knowledge at the base-level can be transformed, upgraded, and value-added through the use of unified Data identifiers, sensors, signallers, and actuators. SMEs need to draw parallels between the biological world and the Post-2000 Digital Convergence systems illustrated in Figure 2.68 and respectively represented by the 2 curves in the drawing. The use of key identifying patterns or characteristics generate the innovative products and services from Nature. It is natural that SMEs gain from this epistemic approach that is founded on bio-markers and bio-transforming catalysts or initiators. Without this concerted approach, SMEs would continue to remain on the base-line of the X-axis of the diagram of Figure 2.68. By contrast, SMEs can move upwards with the help of bio-inspired thinking of generic knowledge-patterns from DNA-molecule aggregations and transformations, as further explained.

On the left of Figure 2.68 are two uprising curves – the left most being Nature's knowledge system and the adjacent curve to its right being the Post-2000 innovations that are characterizing eGID. The second curve represents the growing base of knowledge generated by the emerging global economy (eGID). Its dynamics are dictated by both the volume of contributors and their effectiveness in which knowledge patterns are combined upon knowledge – information – patterns.

Direct parallels can be observed between Nature's knowledge dynamics (that has existed from the time of human civilization) and the Post-2000 eGID landscape. Every Post-2000 innovation

appearing on the eGID landscape has its parallel or exemplar in Nature's Knowledge Management System. This is the key lesson for SMEs – that they need to be aware that the speed at which these pattern accumulations and transformations can be leveraged is dependent on the "Mindset" of the SME innovators. This is a further reason why Bio-inspiration must be considered for SME strategy making. By so doing a SME equivalent curve can be created. This will allow the SME to better manage the knowledge gap that currently exists.

2.4.14 Critical Evaluation

This section has presented the series of issues that SMEs must take into account when they address the key source from which business strategy-making originates. The Knowledge Management Movement appeal in the 1990s has in importance to a significant extent. However the issues that could wear expounded to remain valid today as ever. The concept of Tacit Knowledge as first made prominent by Michael Polanyi directly applies to SMEs. It can be rightly said that SMEs do know more than they can describe. Their so called "gut feeling" is effectively a misnomer for the neuronal signatures and the neuronal circuits that have created images of knowledge and its potential application – in the mind, but with which SMEs find hard to describe.

Polayni's Tacit Knowledge and its simple combinations with Explicit Knowledge as proposed by Professor Nonaka present the ideal platform for SMEs to re-consider what they know and how it can be combined with external knowledge – to launch the "knowledge spiral". SME strategy-making cannot however ignore the human person entities, the possessors of the tacit and explicit knowledge and its "knowledge-spiralized" enhancements. For these reasons SME must consider the inclusion of business models and building blocks presented by the sugges5ted use of the Appreciative Inquiry programs. To obtain the best from potential partners and members of the business ecosystem being created by SMEs, they need to access the most positive segments of the mind of these individuals.

The Appreciative Inquiry process while it is founded on psychology and social relationship management issues can indeed be incorporated into business strategy making by its combined use with strategy-making building blocks such as the Boisot I-Space. Once "Codification" of the challenges or technologies necessary for innovation and participation in eGID are "published and shared" with intending eGID collaborators, the I-space's 2 other axis can be mobilized with relative ease. This will only be achieved by the contributions from the membership, whose minds would be "primed" to make positive contributions on the "Abstractions" and the "Dissemination" factors of good strategy-making concepts and innovations.

The Knowledge-derived sources of building blocks therefore demand a "meta-strategic" approach from SMEs who will need to not only be aware of these knowledge mobilizing concepts, but also to implement them in the best neuronal environment of the mind for maximum effect.

In summary it can be argued that while the Pre-2000 version of Knowledge Management may not be fully appreciated for the high expectations that it initially generated, it has indeed established the pathway that leads to the concept of Wisdom management and the mandatory need for Wisdom to meta-supervise the issues of Knowledge, Information, and Data. SME strategy-making has significant potential to gain by using the "helicopter-effect" of Wisdom.

This is because the relatively limited knowledge of an SME (compared with the combined knowledge of a typical business ecosystem) must be leveraged with the knowledge on how to manage the aggregated knowledge – the definition of the trait of Wisdom. In laypersons terms, it extends the saying that "its not what you know, but who you know" by expanding this concept further and "knowing" how to mutually benefit with those who know.

2.5 Innovation driven Business Strategies

"Because it is its purpose to create a customer, any business has two, and only these two, basic functions: marketing and innovation"Drucker (1954) – The Practice of Management, Harper Collins

The complexities and the dynamics of the emerging global Industry Development sectors (eGID) can be directly traced to the intensity and the proliferation of innovations in product, process and integration of effort among members of business ecosystems. The innovations are characterized by reducing product life cycles and continued enhancement of product features and functionality. The mobile phone for example is the epitome of the rapid change in product designs, functionality and in the distribution methods. Original Equipment Manufacturers (OEMs) for example are rarely responsible for direct sale of their products. The telecommunication industry has effectively taken over the distribution of the continuous roll-outs of new versions. It is not surprising to see innovations in one model being replicated in another OEM's product in the next launch, in a continuous game of innovation catch-up.

A whole industry of "innovation" reporters and experts have developed as a result – extolling the benefits of innovation, and reporting on the different methods to capture innovation. This section therefore reviews the "Innovation Management" discipline to determine if these reports can provide SMEs with strategy-making skills and competencies.

2.5.1 Aggregate Knowledge for Innovation

The two giants of the "innovation Management" movement who have presented opportunities and insights for SME strategy-making are Joseph Schumpeter and Peter Drucker. Both of them have presented the framework in which innovation is rightly presented as the end-state and game-changer for business growth, profitability, and sustainability. Schumpeter's call for businesses to be mindful of the "creative destruction" mechanisms of capitalism are much clearer to see than when it was originally proposed more than 60 years ago. The continual need and challenge of "New Product Development" to be structured into the psyche of strategy-makers and decision makers is beyond question. Less clear however is the pathway that is required for the challenge of "creative destruction". The unique and relatively strange process that requires the killing off of the earlier innovation (of which one would expect to be proud), in exchange for recognition and reward from its successor is a difficult pathway to consider even before any implementation of this challenging mindset.

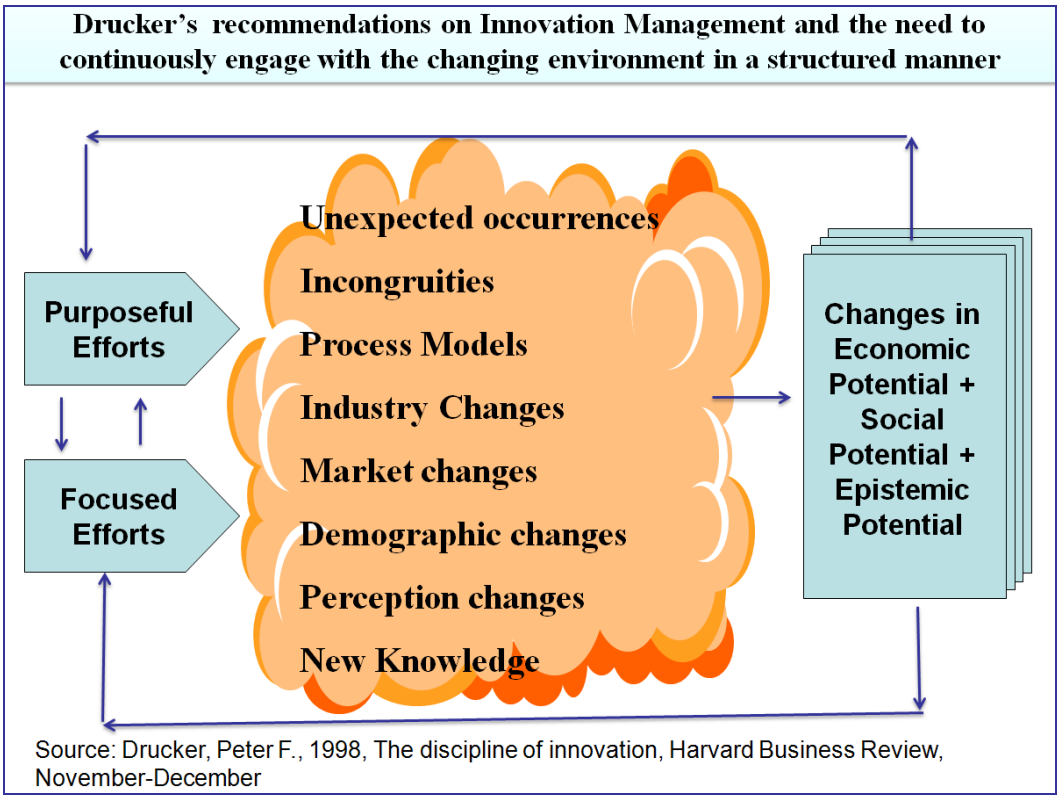

Figure 2.69 – Drucker's insights on the challenges of New Product Development

Peter Drucker's approach to this pathway has been illustrated in Figure 2.69. On the right side of the diagram are the challenges for new products that need to creatively destruct and replace earlier innovations. The consideration of the required innovative pathway must take into account the impacts of the PESTE forces. The SME must take into account the changes in market boundaries, needs and demands of global clients, changes in delivery systems, and fulfilment methodologies. These are but some of the strategic issues that must be addressed by the replacement innovations and the required strategy-making concepts and approaches.

These challenges are illustrated in the centre of the diagram as well because the strategic changes affects both the "Supply-side" and the "Demand-side" of the innovation chain. On the supply-side, SME strategy-making must engage and mobilize the minds of their business ecosystem membership – to align their thinking with the "demand-side" of the market. Without this alignment, the innovations expected to creatively destruct the earlier versions may not achieve the full expectations. It is in this context that Drucker argued strongly for both "purposeful and "focused" efforts, as illustrated in the left side of the drawing.

In Drucker's view the Model Development process requires a compartmental approach to the creation and management of the "replacement" innovation concepts. Figure 2.xx illustrates the stages of the "innovation-chain". The "fuzzy ideation" segment illustrated on the left of the drawing is the front-end of the Innovation / New product development (NPD) cycle. Drucker argues that this is a relatively in-expensive compared with the follow-up stages – hence work in this front-end stage should be maximized. The spin-off benefits can be huge from both perspectives –

(i) low cost per idea creation,

(ii) Higher feed rate or increased input volumes as feed to generate pro-rata or proportionate increases in innovation and NPD outcomes, and
(iii) Greater probability of success with generated ideation despite their general passage through the Innovation funnel of barriers.

Drucker, ever the supporter of "marketing and its focus on the customer" also argues for the linkage between the downstream changes and their constant point of reference to the concept of "Customer Value Proposition" fulfilment.

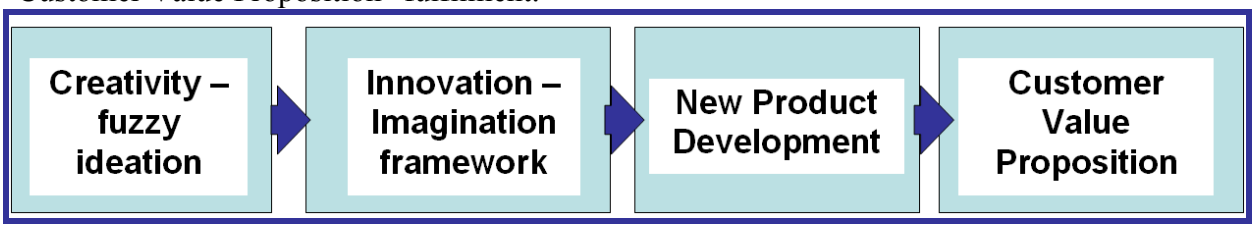

Figure 2.70 Process stages for Creative Destruction and Schumpeterian Innovation

In the Post-2000 era of strategy-making lessons for SMEs, the insights and thought leadership on creative destruction as presented by Harvard University Professor Christiansen are unsurpassable. Research by his t4am focuses on the integration of Knowledge-based Competencies in New Product Development – but in the context of continual "creative destruction".

Christiansen, Hansen, Varnes, and Mikkhola (2005) argue for new competence strategies or "meta-strategies" to be deployed in organizing product development for the dynamics of the Post-2000 emerging global markets.

Their constructivist or "meta-strategic" view-point is presented on the need for aggregating competencies for new product development. The meta strategies need to interpret, select, mobilize, and manage the primary competencies (that have been described in the earlier concept groups presented in this Chapter). This 2-stage approach effectively involves the management of a knowledge-based ecosystem. It aggregates the primary and the meta-level knowledge-based studies of those competencies associated with the needs of eGID. The meta-level strategies must specifically involve knowledge interpretation of PEST forces, localized Industry forces, and knowledge-interpretations of the successful operators of the eGID.

The embedding and embodying of this aggregated knowledge within the innovative outcomes from the knowledge ecosystem. – using competencies as the point of departure for new product development

Ogawa and Piller (2006) offer valuable insights for SMEs strategy-making on reducing the risks of new product development, which experience failure rates that exceed 50% mainly due to faulty understanding of customer needs. Their research at MIT confirms that knowledge about customer preferences and requirements are the single most important area of information necessary for successful NPD.
SMEs need to specifically benefit from Ogawa and Piller recommendations on the use of customer co-creation platforms. They have cited examples of successful innovations developed by 3M, P&G, BMW, Addidas – using the web to seek incorporate end-user involvement in the innovation chain and their on-going NPD strategies.

Information on successful examples for SME strategy-making and the building blocks for innovation are well reported on the Web. Figure 2.70 for example confirms the necessity for engaging end-users and clients in the innovation chain, before investments are made.

The start-up firm "Threadless" is a simple model that has addressed the issues confronting all SMEs. As illustrated in Figure 2.71, Threadless has taken the strategic concept of "the web-platform" even further – by fully automating the entire innovation chain process, from the inception stage of NPD through to fulfilment by maximizing "Collective Customer Commitment"

Figure 2.71 – Strategic End-user engagement for New Product Development facilitated by the Web

Customer inputs are actively encouraged and integrated in the innovation process - with Threadless soliciting ideas and designs for their new product concepts. In their web site at www.threadless.com they request commitment from customers to both design and purchase a new product before Threadless commences any final development or manufacturing investments.

Their "Collective Customer Commitment" not only generates T-shirt designs but also ensure that the designs are subject to fast moving customer trends, and distribution challenges. Decisions on investments and global commercialization are based on the customer's viewpoints on selected designs. SMEs should not that yet none of the hundreds of Threadless products have ever flopped. Threadless uses communities of customers and designers and actively seek pre-orders – based on the evidence provided on the demand and needs expressed by potential customers – that are recorded in the pre-production engagement.

Muji the Japanese retail chain similarly uses "Collective Customer Commitment" for their in-house branded household goods, apparel, and food – using their 410,00 member customer community as their sounding board and co-producer. Members submit and pre-evaluate the aggregation of their knowledge and expectations on innovations to be created (www.muji.com) .

2.5.2 Innovation Facilitation by the IT

A key development of the strategy-making potential for MNCs is the availability and use of the enabling infrastructure provided by the IT-industry sector. Innovations within the IT-industry sector itself have by themselves been significant with true fulfilment of the famous Moore's Law on the time within which capacities double and prices drop. As a result technology-derived innovations have been responsible for new communication systems, content creation and content development systems, content management systems, business analytical systems, etc. MNC strategies have made full use of the new capabilities in communication, content and business process integration for innovation embedded within new products, new processes, and new management methodologies for the digital business ecosystems, so created.

The list is endless with organization such as Apple, Oracle, Microsoft, Google, HP, and Cisco and Samsung and Nokia – all providing proof of the power of innovations facilitated by digital technologies.

The challenge for SME strategy-making is to strip away the technological details and focus on the functionality being delivered and the innovative manner in which this functionality has been transformed from their earlier Pre-2000 origins.

Research by Albert (2006) on the manner in which the technical stripping and the creation of innovative products with the new Post-2000 technological developments focuses on the lessons from managing change at HP Lab. The epistemic chaos and the complexity confronting SMEs have been managed by HP by this process of stripping down the Core functions and then re-building them to their latest innovative best. The "Creative Destruction" mandate is the key requirement in the manner through which HP has mobilized innovation, knowledge management, and the becoming of a learning organization.

Wilson and Daniel (2007) add to this "Stripping and re-building approach" by introducing the need to consider the use of multi-channels that become almost immediately additionally available with each new technology-based re-build. They argue strongly for the need to develop a dynamic capability approach if the technology-generated innovations are to succeed.

2.5.3 SAAS Model-based Innovations

SMEs need to specifically consider the new dimension of "Cloud Computing" and its impact on strategy-making – from a number of viewpoints including investment costs, speed of implementation, user-friendliness and scalability issues as the business grows.

In this context, a major transformation strategy being offered to multinationals is the use of the "Software-as-a-Service" capability. In its most basic form, the SAAS-based strategies involve the OEM receiving total turn-key support the hosting of specific Application Software programs. In the case of business logistics and warehousing for example, the OEM or leader of the supply chain would be supported by SAAS services for the collection and management of data across

the entire supply chain pipeline – in real time mode. Every transactional exchange point or location is monitored and relevant data collected, digitized, stored and transmitted to nominated decision-makers. In addition, the accumulated data is transferred to a central location at which the "data mining" operations take place.

The SAAS-based strategy would then utilize statistical and analytical programs over the data collected for the supply chain's operations. Valuable insights for strategy-making would be generated by the analysis of this data in real time and historic modes. More importantly the reporting functions of the analytical software would provide "evidence-based" knowledge and insights to decision-makers. The knowledge is presented in user-friendly graphics, illustrations, charts, reports, and so-called dash-boards.

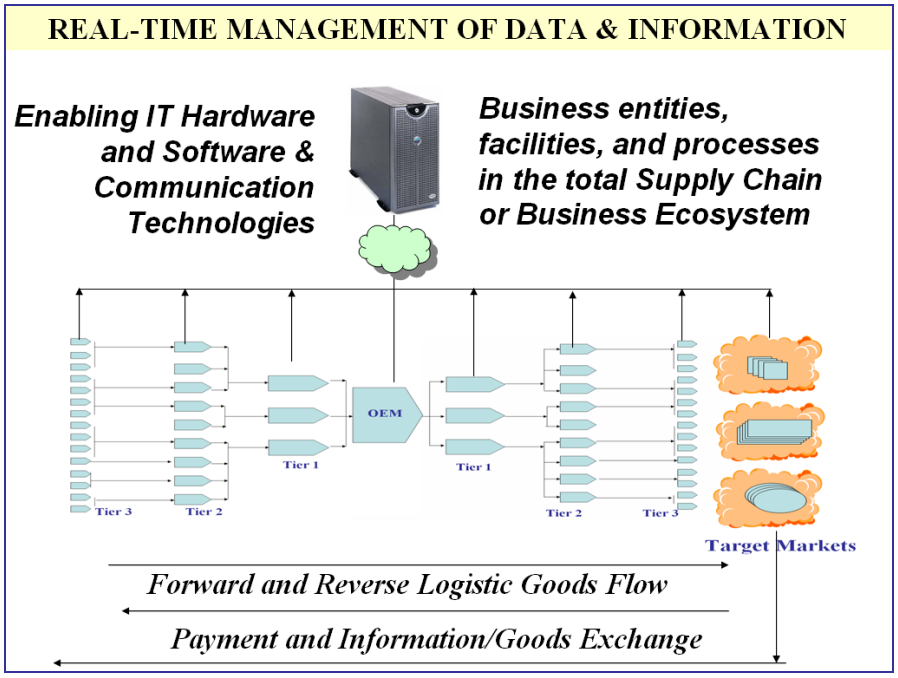

Figure 2.72 illustrates the manner in which Software as a Service (SAAS) type strategies are the epistemic forge for innovation

Figure 2.72 illustrates the manner in which SAAS-based programs and activities implemented by multi-nationals have been utilized for the creation of innovations in process management and improvements in delivery and fulfilment. As illustrated in the lower section of the diagram, the entire Porter Value Chain or Supply Chain Network is engaged in the physical operations of procurement, fabrication, delivery, fulfilment and return of faulty products (known as reverse logistics).

Superimposed upon the physical layers (in the upper section of the diagram) are the data collection and data digitizing hardware and software that is made available as part of the SAAS system. At selected points the locally collected data from the Supply Chain Network is transmitted to local database systems and central repositories.

The upper part of the diagram also represents the collection of Enterprise Servers which can access all of the data collected over time spans. At this point "statistical and analytical packages" use the digital information as digital feed-stock and generate the reports for the

Software-as-a-Service Information management functions – that are made available to the Operational Management staff for their day-to-day functions in the physical supply chain. In addition Executive Information Management System functions are generated in the form of reports, alarms, trend lines, decision-making events, reports by exceptions, etc. The SAAS engages and analyses the received data both in real time-mode and in batch-modes – and the outputs can be dynamic or historic. The outcomes from the analysis are provided to the decision-makers in the Supply Chain Network for long term business strategy-making beyond immediate operational control.

A key development of the SAAS and its strategy-making potential is the availability of the Internet as the common platform for communication not just between human persons but also machines and combinations between the two types.

The lessons for SME strategy-making extend beyond the digital technologies and permeate into business development, expansion, new market entry, and real-time testing of new processes or business ecosystem configurations.

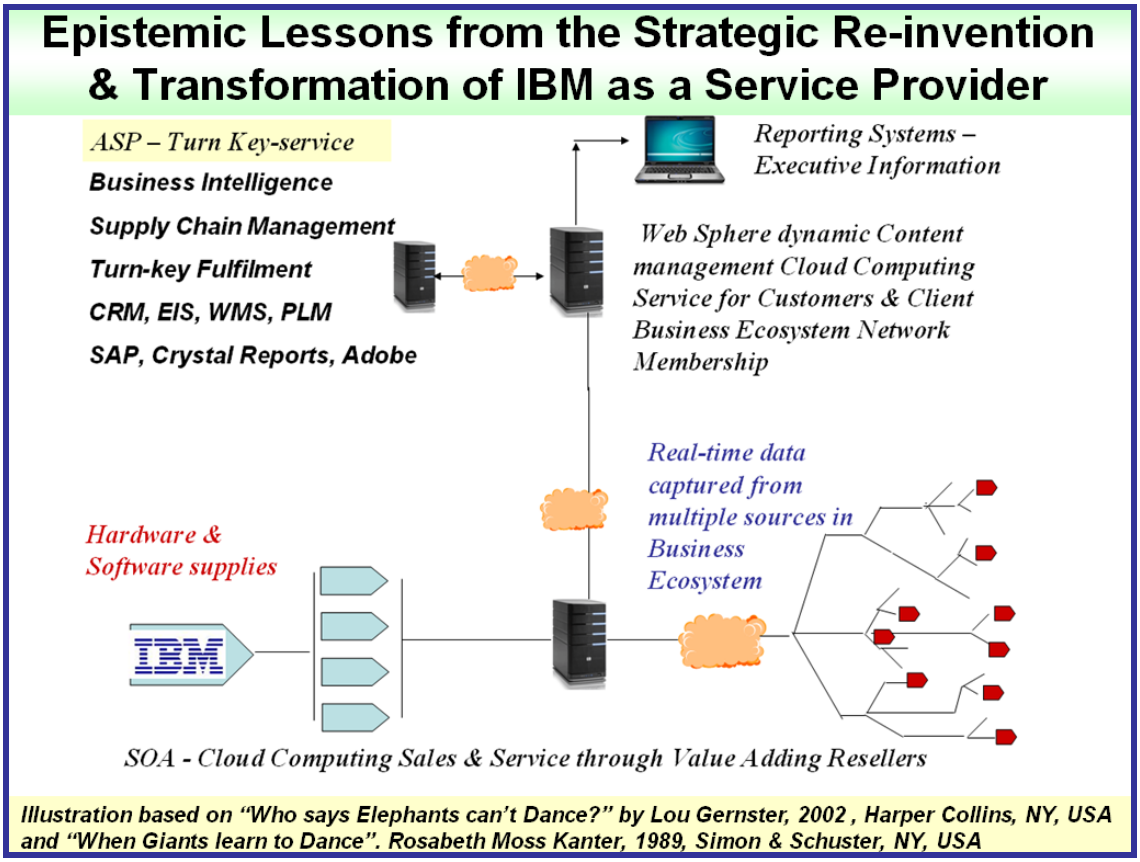

Figure 2.73 Epistemic Lessons for strategy formation based on the transformation of manufacturer status to service provider.

SMEs have one of the best examples of the need to consider strategic transformation from manufacturer to service provider while still being available to retain their manufacturing expertise and competencies. Figure 2.73 illustrates the manner in which the IBM firm

transformed themselves from a hardware and software provider into a fully resourced "Service Provider" that manages the logistics and physical supply chains of other manufacturers and entities. IBM's core competencies cover a broad spectrum of hardware and software. In the diagram it uses each of these competencies in an integrated manner. The hardware is used for their servers, the software for the Operating Systems of the servers and the networks, their Databases for the storage of the data collected from the physical operations. Where needed IBM also uses external resources for special application programs. These include specialist programs for logistics that might be provided by specialists such as SAP of Germany.

The diagram illustrates how IBM mixes and matches all of the internal and external resources within the multiple networks for multiple clients in IBM's delivery of Software as a Service. Multi-national clients are relieved of the need to create and build in a relatively slow and expensive manner to match the functionality available from IBM's SAAS. End-user clients (shown on the lower right) may also involve the very members of the supply chain network servicing IBM as the client in their own right.

Every nominated member will be connected to the SAAS system to supply data or collect data or share data in native or aggregated form. Data collection takes place locally and globally and is sent to the IBM server (lower centre) using secure internet communication systems, which are set up as part f the total turn-key service. Data once received at the IBM business service centres is then subjected to the business process analysis and strategic analysis. Benefits exist by linking and leveraging the Pre-2000 business model of the physical supply chain with the Post-2000 service oriented and technology-generated transformation.

For SME strategy-making multiple lessons for strategy making can be extracted from the IBM-SAAS model of business development in the Post-2000 era. They include:

(i) The transformation and upgrading of Pre-2000 business models and making them relevant to the needs of Post-2000 clients

(ii) The interlinking, seamless, and mutually reinforcing natures of the Pre-2000 and Post-2000 business models

(iii) The immediate availability of the existing IBM client base, to be presented with marketing proposals that delve deeply into the estimated benefits of the transformation to the SAAS model, based on real data

(iv) The scope to replicate the model across the entire client-base, in multiple industry sectors, and

(v) The use of "nano-controller" systems to monitor and manage the information network, but to also assist end-user clients and decision makers with trends and predictions made possible from the nano-controller approaches to managing the collected data.

2.5.4 Cloud Computing-based Strategies for Multi-Nationals

SME strategy-making can also benefit from the on-going development and innovations being generated by advances in "cloud computing" beyond the external hosting of specialist application software. An entirely new global business domain has been created to service industries with "turn-key" services that cover the entire spectrum of business operations. SME

strategy-making needs to take advantage of these developments and the emergence of the sector as illustrated in Figure 2.xx.

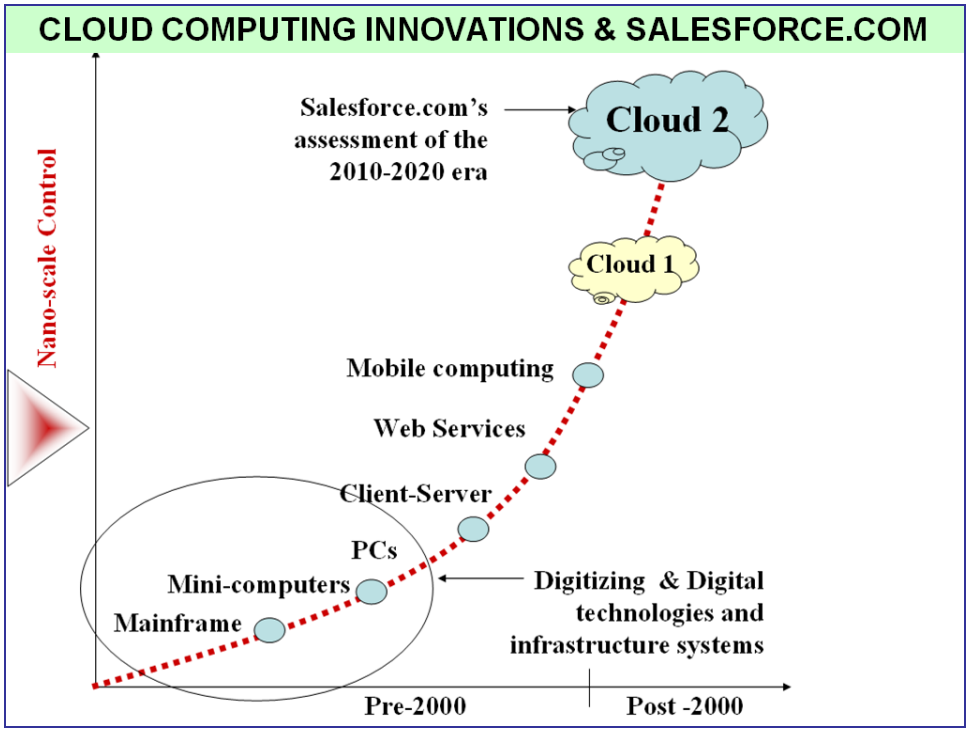

Figure 2.74 – Lessons for strategy-making from Cloud Computing technologies and services

Figure 2.74 illustrates the evolution of the innovations that have been made by the IT industry and which are immediately commercialized and installed, deployed, operated and managed by the IT industry itself on behalf of their MNC clients. Essentially starting from the availability of the Mainframe computer (lower left section of the diagram), the IT sector have been crafting strategies for their MNC clients – strategies that have progressively adapted and changed and enhanced the scale and scope, productivity, and profitability of the physical operations of the MNC firm-client.

The progression and advances of the computer and digital infrastructure sectors have created new business opportunist involving Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Business as a Service (BaaS) – all in turn key mode.

The lesson for SMEs is to seek to develop business growth strategies that can leverage off the new resources that would be available on a "per click" or usage basis. SMEs do not need to invest in the significant levels of IT infrastructure, nor do they need to engage whole department just to manage their IT systems. Instead SMEs could consider the ready-to-use status and the extensive resources made available with the SaaS, PaasS, IaaS and BaaS business offerings.

In a stage twist of the innovation-engine, SMEs could make use of the very same infrastructure that has been responsible for the global reach, expansion, and profitability and aggregation of services that have been responsible for MNC successes.

The challenge for SME strategy-making is to envision their existing operations and to fit them within the "cloud infrastructure" and its capabilities of filling gaps in the resources for global reach and fulfilment.

2.5.5 Open Innovation

Open innovation involves seeking inputs from stakeholders and inventors far removed from the typical MNC "industrial laboratory" setting for conventional innovation management. The Research agenda and challenges confronting SME strategy-making are not different from the epistemic position of the MNC or the global business corporations – in their Pre-2000 historic mode of operation. Although these MNC firms are endowed with significantly higher levels of resources, they too were forced into developing strategies that would enable them to better function with the new and changing dynamics of the global economy (eGID). A relatively new Post-2000 strategic approach being deployed by smart MNCs involve the MNC firm opening itself to the opportunity of harvesting knowledge from non-traditional sources – ie. from outside of the corporation, as illustrated in Figure 2.xx.

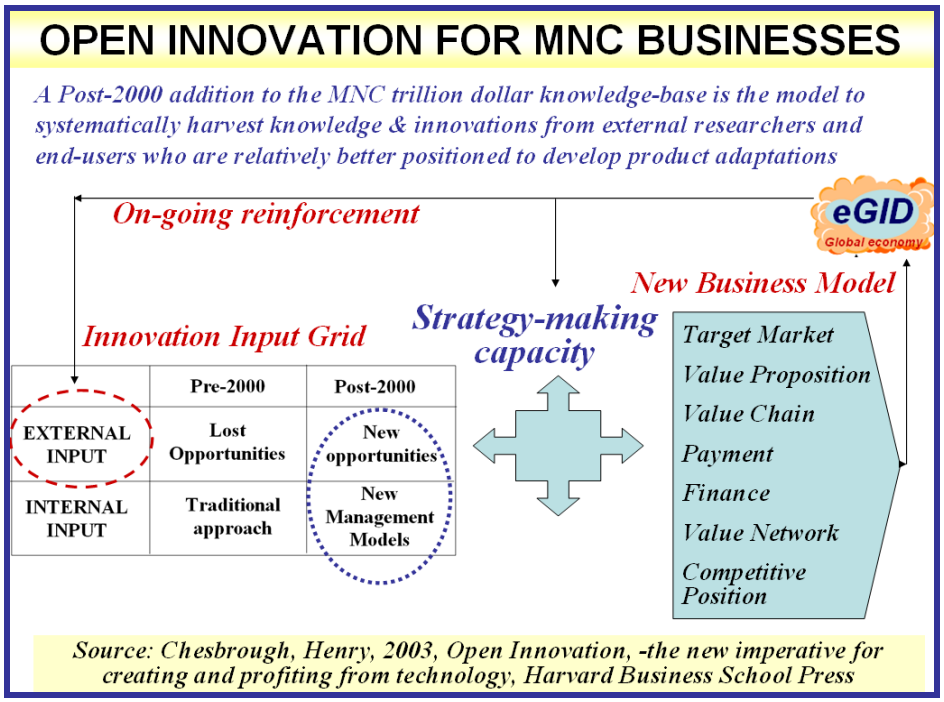

Figure 2.75 SME strategy-making lessons from the concept of Open Innovation

The concept of Open Innovation offers good scope for SME consideration and adaptation of their eGID strategies. Figure 2.75 for example illustrates the manner in which MNC firms formalize their Research and Development units (lower left of the diagram). In the grid shown, the MNC recognizes that "knowledge-gaps" need to be addressed with "mix and match" strategic approaches. Through this recognition of an external input into their innovation crating mechanisms, MNC firms systematically develop the capacity to harvest the knowledge and innovations from external stakeholders. In the Innovation Input Grid (shown on the left) innovations, suggestions, adaptations and new product perspectives are actively solicited and encouraged from external stakeholders including end-user customers. Traditional internal

research would continue in parallel. In addition however MNC firms are encouraged to develop an integrating capacity to link the internal inputs with the external inputs. The new strategy-making capacity (centre of the diagram) should be sufficiently developed to create new business models (right) in order to make connections with the global economy. The final requirement is that the MNC develop a capacity to monitor the developments of the global economy with a proactive approach for "Open Innovation" capacity building.

The lessons for the SME considering Open Innovation strategies are that the infrastructure is relatively easy to build. The availability of the Web and internet technologies provides SMEs with unprecedented access to the same global pool of knowledge as the MNCs who have pioneered the Open Innovation concept.

2.5.6 Disruptive Innovation

Research by Professor Christensen (1997) of Harvard University has tracked the significance of the disruptive impacts of technology and the need to manage the opportunities that can result from the disruptive effects. The research by Professor Christensen provides a clear explanation of the strategic and innovative mechanisms that have resulted in some of the most spectacular innovations and industry changes of the 20th. century. With its research focus largely based on the work of Multi-National Corporations (MNCs), the concept of "disruptive innovation management" provides lessons for MNCs that can be re-framed and used for SMEs.

For example, the concept of the "Value network" has been proposed as a strategic mechanism to harvest the benefits from the propensity of the IT industry to continually advance with disruptive innovations that upgrade or totally replace earlier technologies. In Professor Christensen's advice to MNCs, they need to adopt a "Value Network" approach in which:

(i) The entire group learns to work together and advance as a group
(ii) Actively monitor the environment for the earliest signs of disruptive influences on the value creation processes currently being delivered
(iii) New perspectives need to be created on the drivers of failure or the issues imposing limitations on the current value delivery chain
(iv) New re-framing of existing mind-sets need to be implemented, with examples such as moving and transforming mind-sets:

- From a "component" mind set to that of a "system" approach
- From Product Design to System Architecture
- From Supply Chains to Value Networks
- From Individual advances to Joint development

Further strategic advice to MNCs includes the management of the "Technology S-curve Framework". MNCs can utilize the grid which maps the Performance Vs Engineering effort that generate the S-curve pattern with indications of the imminent appearance of the disruptive technologies. Using extensive field research, Christensen explains how the mechanised earth moving industry has dramatically changed from the disruptive innovations in:

- Moving from gasoline engines to more compact and powerful diesel engine technologies
- Moving from mechanical connections and cable wires to hydraulic powered systems
- Moving from simple movements to complex trajectories
- Multiple powered actions through articulated arms and powered outlets

- Moving to multiples of unit load sizes whether it is the bucket size of the excavator or the cut and fill operational steps.

2.5.7 Frugal Innovation

Prahalad's "Bottom of the Pyramid" strategy and approach largely appealed to MNCs to develop strategies for reframing and integrating resources of Multi-National Corporations (MNC) so that it could serve the developing world. Prahalad argued for the development of strategies that would achieve profitability from the volume of the markets that potentially reside with the developing world. Frugal; innovations strategies required the MNCs to research and develop cut-down versions of the products and services that they would normally deliver to the rich nations of the world. The strategy was to secure profitability with volume and by pruning costs and reducing margins (relative to the smaller but more highly priced markets and numbers in the West).

MNCs would still be able to achieve high profitability because of the large volume of customers that exist in the developing world – the difference being 3.5Bn Vs 1.5 Bn in the Western markets. It is from this meta-strategy type approach on serving low cost markets that the term "Frugal Innovation" was developed. The strategic implications and challenges for SMEs is decide on their position that they wish to maintain or develop on the Integration-Response grid. SMEs could decide to work with MNCs to develop parallel versions of "frugal innovations" in the intermediate markets of the West. For example in the remote regions or in the areas not immediately serviced by large Australian firms or Multi-National Corporations could be a target for frugal innovation.

A good example of the frugal innovation strategy is the collaboration between French owned MNCs and relatively small catering firms and operators that service the rail travelling public in India, as illustrated in Figure 2.xx.

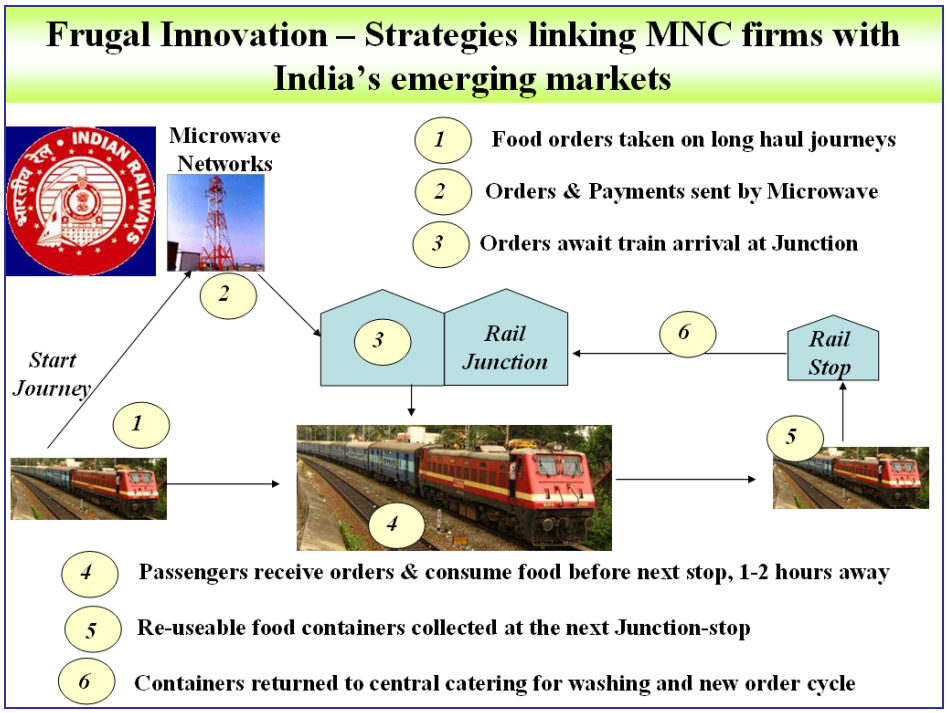

Figure 2.76 – Strategy-making lessons for SMEs fromt he concept of Frugal Innovation

Of all of the MNC created innovation models and building blocks, the concept of "Frugal Innovation" offers particular relevance to SMEs because of the resource limitations of SMEs and the natural markets in which frugal innovation can best survive. Figure 2.76 is an example of "Frugal Innovation" strategy in which MNC firms from the West are seeking to enter emerging markets by customizing cut-down versions of their conventional product services in conjunction with local SMEs.

In this context French Catering and Hospitality industry firms are keen to enter the emerging market in India to benefit from the millions of food-consumers who travel interstate on the Indian Railways network. Starting from the lower left of the diagram, a train passenger wishing to be served with meals taken while on the run, places their orders at the start of their journey. Almost immediately, the aggregated orders are transmitted via an internet connection to the next stop of the journey, some 3-4 hours away on the rail network. When the train does arrive at the next stop, there is only sufficient time for teams of mobile waiters-servers move into the rail compartments with the ordered meals. The train then departs to the next junction, some 2-3 hours further. The mobile waiters then distribute the ordered meals to the travellers, who have more than an hour to complete their meal while the journey continues. At the next stop, the mobile waiters disembark with the collected empty trays. The cycle is repeated for the next meal and for travellers proceeding in the opposite direction.

The SME strategy-making lessons are that a fully integrated physical and age-old service (such as a catering service) can be integrated with modern technology. In exchange for high returns on smaller volumes of product sold, the bottom line profitability is boosted with smaller returns from a significantly expanded volume or base number. In the illustration Post-2000 technology combined with an age-old catering service enables a third-party entity (such as the rail network)

to transport passengers without having to stop for long periods just so that its passengers can have access to meals.

The SME lessons from frugal innovation are that the third-party entity would need to be co-opted to participate in a "frugal business ecosystem". In this context the Indian rail operators benefit by minimizing their total time for travel. Journeys are speeded up because they are limited to the time only required travel and for embarking and disembarking of their passengers. Importantly for the success of the frugal innovation concept is the use of the Indian Railway's infrastructure that is made available for this symbiotic co-creation. The railway's microwave communication network normally required and dedicated for signalling and operational controls is made able to deliver the digital messaging and transactions necessary for mobile and extended functionality. The typical micro-wave network is easily enhanced with internet connectivity. Further enhancements of the frugal innovation-catering service involve the delivery of entertainment and web-based communications by its subscribing passengers.

2.5.8 Management Innovation Strategies

Professor Gary Hamel (2007) is the key proponent of the further range of strategic approaches available for SME consideration. Hamel argues that the concept of "Management Innovation" is the last frontier of strategy-making approaches. Its focus on business process innovations has been relatively left untouched in the Pre-2000 mode of business strategy-making studies and research. Hamel argues that the availability of Post-2000 technologies for business process innovation are ideally suited to exploit the advances in technologies for communication, joint action, collaboration, and scale expandability and aggregation of efforts by business ecosystem membership. Business Innovation offers the best opportunity for the delivery of new products, processes, entities and expansion for smart MNCs in the Post-2000 era.

Hamel further argues that the 100 years of Pre-2000 business strategies have reached the limits of their value because of their focus on product innovations and process innovations that are constrained by the older version of technologies. Hamel compares the Pre-2000 era to the "industrial age" of innovation and argues that the Post-2000 era will spawn a new range and portfolio of opportunities in almost every industry sector.

In the case presented by Hamel, the demands of the Post-2000 global economy requires a fluid approach to strategy making that must recognize the reality of the global economy's increased capacity to research, develop, manufacture, transport and consume products from every where, and for everything. Hamel argues that the continuation Pre-2000 strategies are not sustainable and their continuation would be similar to the pre- industrial age thinking being used in the current time, irrespective of whether it is for new products, cost-control, or Human Resource management or innovation.

The lessons for SMEs are that the "command and control" approaches to managing employees and strategic thinking needs to be abandoned. The knowledge economy demands that the potential contributions from the "minds" of ecosystem members should be valued and taken into consideration with the new Management Innovation approach. Hamel's Management Innovation directly addresses the need for the "Management Innovation Model" to be developed in parallel with all of the other "managements" of Risk, Human Resources, Finance, and Operations.

Innovations result from the combination of the 2 parallel streams – whereby the Management Innovation layers progressively enhances the functionality and the profitability of each of the conventional approaches.

Within the Management Innovation Model, new strategies would be developed that created business models that combined the best value inputs from the different inputs and sources required creating and satisfying the demands of the global markets. A key requirement in the Management Innovation Models is the use of the Internet and Web technologies, some of which go by the name of "Business 2.0".

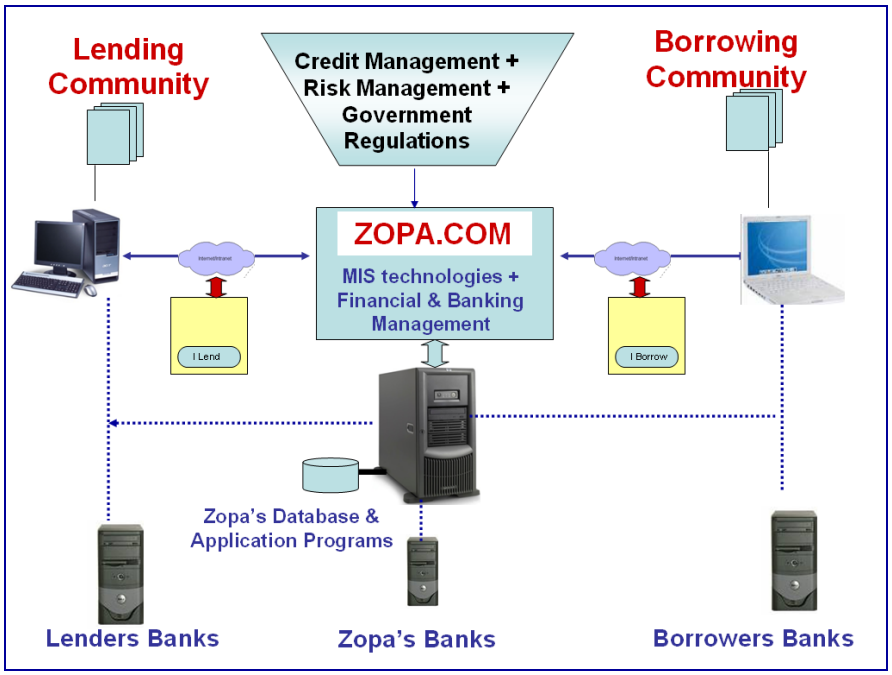

Figure 2.77 – SME strategies for real time balancing of supply with demand using Web technologies

An example for SME strategy-making consideration involves the firm "Zopa.com". Figure 2.77 illustrates the functioning of an innovative "Management Innovation Model" which underpins its financial, economic and social values being delivered to multiple communities. The focus at Zopa.com is on the management of the supply and demand for money between potential lenders and borrowers. The strategy in place uses an On-line Server based business to record the availability and willingness of potential lenders to participate in the program with a focus on mutual benefit with those in need of funding. Lenders enter into contractual connection with the start-up firm at www.Zopa.com. On the right of the diagram is a parallel contractual relationship with potential borrowers.

Both groups record their respective capacity to work together under the management of www.Zopa.com and the ecosystem of their respective banks. Using secure internet transactions and database connectivity, Zopa organizes the loans from its contributing lenders. A key strategy is the "Governance, Regulation and Control" exercised by Zopa in every transaction on an individual and collective basis.

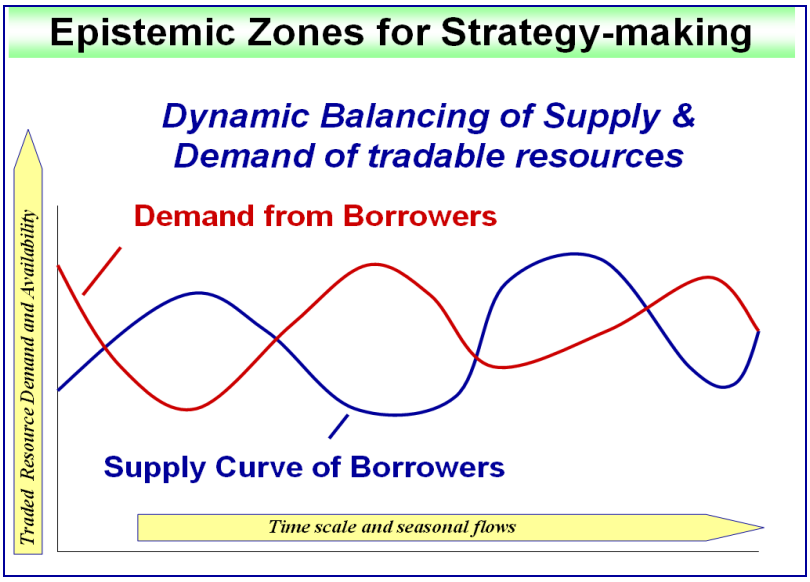

Figure 2.78 – The key functionality of strategies requires real-time balancing of supply and demand situations.

Figure 2.78 illustrates the issues that SMEs will need to consider beyond the technical infrastructure that would on the surface appear to characterize the innovation. Zopa's success is underpinned by the real-time management of funding – based on the supply considerations and demand requirements. Special application software programs deliver this service. SMEs operating with other commodities being traded on a global platform will need to similarly support their trading functions with such back-office and intellectual rigour.

For example, as illustrated in Figure 2.78 the concept of a global"Zopa.com" trading platform can be extended globally, beyond their original deployment in the UK. Technologies are available for multiple "virtual machine" servers to be set up for different countries or regions. The economies of scale and the economies of aggregation would provide further opportunities for innovative "supply-demand" general balancing of funds and dedicated matching of specific borrowers with lenders.

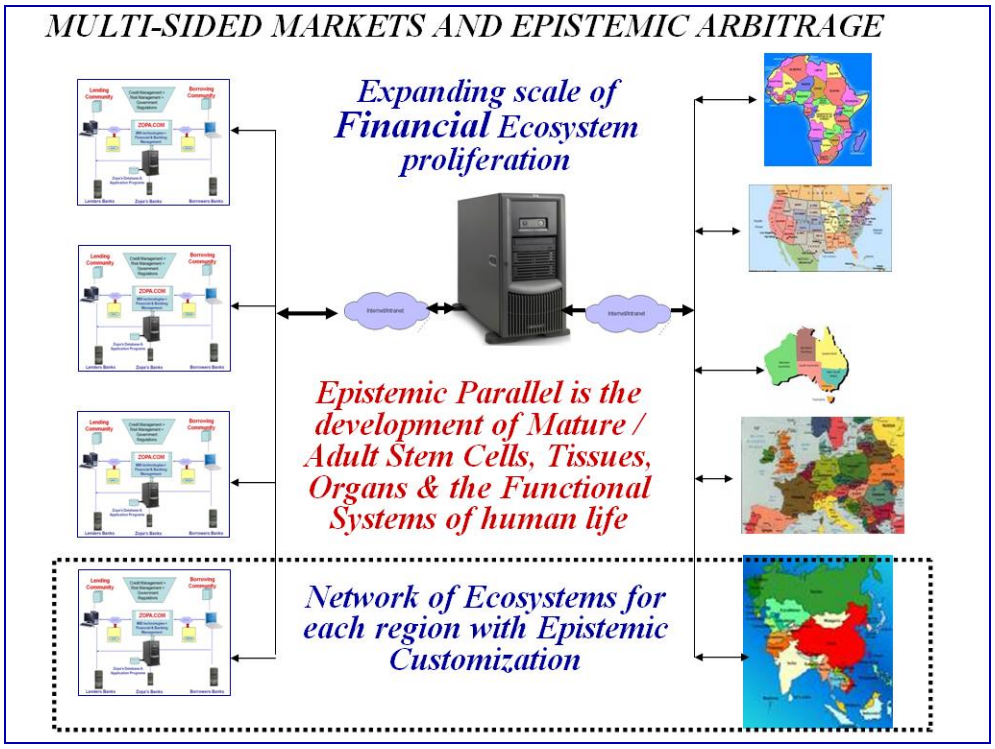

Figure 2.79 – SME strategy making using Virtual Machine-ware for extended reach and scope

The concept of "Virtual Machine-ware" can be specifically applied to the Zopa.com model. Figure 2.79 illustrates how the relative simple concept of linking borrowers with lenders through a real time "Management Innovation" strategy could be extended to other markets. The original version of www.Zopa.com was created in the UK and its founder-directors are largely from the MNC global finance sector. Similar situations would exist in most other countries where MNC firms have had access to the type of individuals that can re-create the www.Zopa.com model.

The key strategic issue for SME strategy-making is that Multi-national firms are on the constant look-out for such innovative business models that are acquired once they establish their functionality and popularity. MNCs would find such start-up innovations a valuable opportunity to work with and cooperate with organizations such as the World Bank and the International Finance Corporation to expand the MNC role by using Zopa.com type boutique banks as the catalyst for their main stream business operations.. The "Governance, Regulatory compliance, and Control" would be provided by the MNC firms and their local employees. The starting finance would be made available by the UN Agencies. The capacity to link networks of www.Zopa.com across nations and cities is a further example of the power of Management Innovation.

2.5.9 Distributed Innovation

The lessons for XME use of the "Distribution Innovation" concepts are largely available from the IT industry and the Open Source Movement. Lakhani and Panetta (2007) have argued that the Open Source Model in particular could be used by other industry sectors. The key issue is that different areas of expertise that together comprise a specific integrated product should have

the development of their individual components assigned to expert and that assignment should also include the assignment of the integration functionality.

Knowledge residing outside of the firm's boundaries need to be mixed and matched and integrated by the use of an expert competency that is able to manage the interfacing and the melding requirements in an innovative manner. The resulting product is an innovative system that is "best-of-breed" in almost all areas of functionality and especially their integrated representation.

The challenge is to access the knowledge that lies outside the boundaries that are unevenly distributed in society and especially in the global landscape. Users need to develop "sticky innovation" models that are innovative in their own right, despite the likely situation that the innovation because the innovator/ integrator is most likely remote from the ecosystem membership.

The Open Source Software (OSS) movement is an acclaimed example of distributed innovation that has been successful against closed and proprietary models. Linux and the range of IT programs such as MySQL, the Apache Server, DRUPAL for content management, and a range of other open source products are proof that the integration can be achieved in an equitable and sustainable manner.

In Figure 2.79 for example, the Cloud Computing platform is generally considered to be the production of a single entity. In actual fact it is a collection of distributed innovations that are melded together in a seamless and real-time manner.

The different SaaS, BaaS, PaaS and IaaS sub-components are generally all brought together from different sources – yet their joining and integrated action are transparent to the end-user. The SaaS package for example could be a third-party software program that has been sourced from a different vendor to the host or manger of the Cloud Computing facility. In a similar manner the same hosted SaaS application software program could be servicing the needs of multiple tenants or end-users on the host's system – again transparent to the different end-users.

The key resource that makes this possible and to which SME strategy-making must now focus is the technology of VM-ware. Virtual Machines are created for each of the End-user clients who each need their own complement of transaction-servers, application programs, database storage, and levels of security.

The Virtual Machine "distributed innovation" function enables the benefits and functions of the main programs to be shared between the different end-users in a transparent manner. The host is required to innovatively combine and customize the integrated/ distributed offerings by managing:

(i) Decentralized problem solving
(ii) Self Selection and Participation boundaries
(iii) Self Organization
(iv) Coordination and Collaboration
(v) Free revealing of knowledge, and
(vi) Hybrid organization model that blends community with commercial considerations

In Figure 2.80 for example, the Central Host illustrated in the centre of the page is the embodiment of the distributed innovation platform. It hosts a dumber of application programs from different third party vendors. In star fashion the different end-users make use of the distributed innovation for their respective tasks and functions. For example, sellers offering goods to the Central Global Trading platform, would be able to access their portion of the Central Server facilities to publish and record the availability of new stock for sale. They would be equally able to access their portion of the central Database system that records the status of the goods that have been successfully traded or which have been unsold over defined time-periods. Specialist application programs would enable the seller to make decisions on discounts based on evidence of past sales or similar products that have been purchased, with the consequent setting of a price point. Finally the Seller would be able to access the proceeds of sales through notifications on credit transfers and banking statements.

The microcosm of the functions of relevance to the Seller would be recreated for other interest groups such as Logistics Service Providers, Buying Agents, Transportation Companies, Government agencies, etc. Each of these distinct user-groups would utilize the shared and unshared components of the hosted facility relevant to their needs.

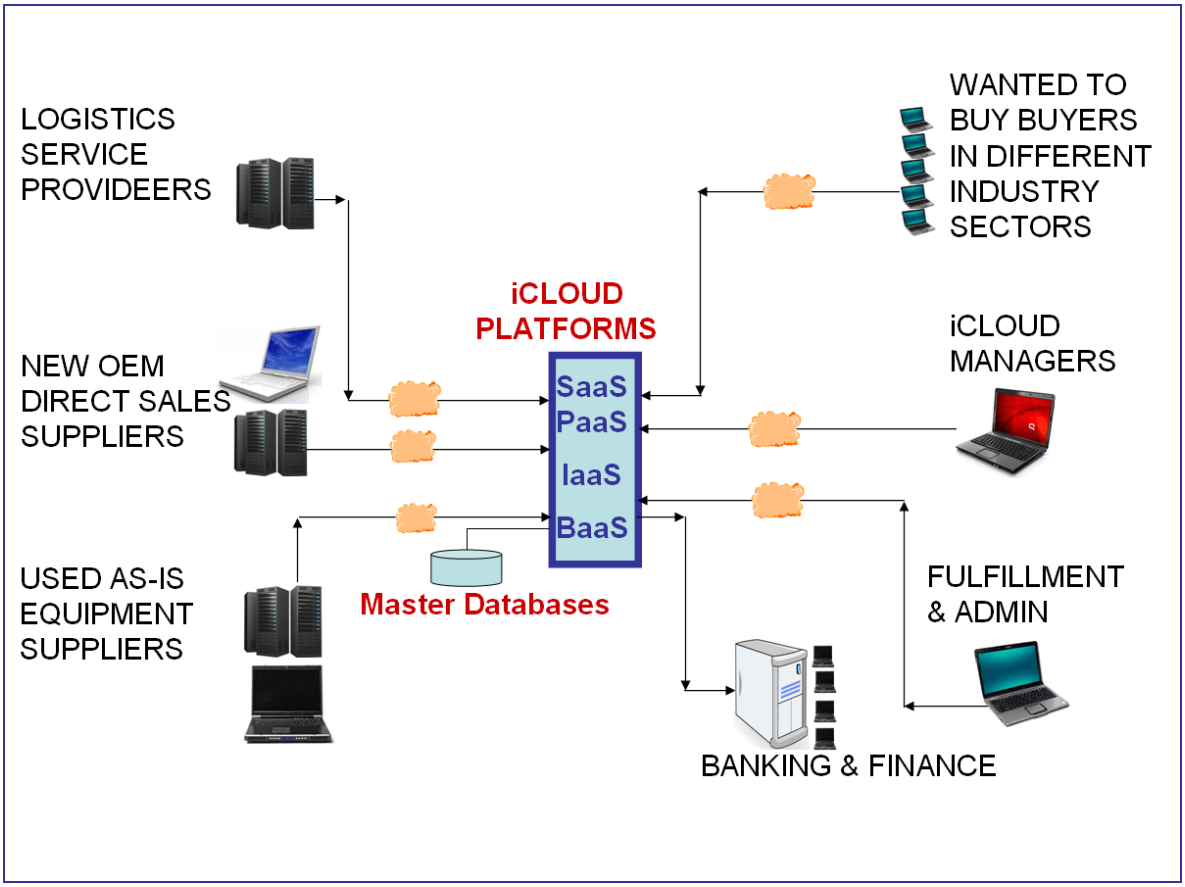

Figure 2.80 – Lessons for SME strategy making from the Distributed Innovation model

The key issue for SME strategy making is to be able to visualize the physical business ecosystem that is necessary for their participation in the emerging global markets that may have an interest in their product innovations. The next stage would be to consider the virtual configuration of the "Distributed Innovation" architecture.

2.5.10 Born Global – A Strategic Phenomena

SME strategy-making can benefit from consideration of the concept of "Born-global" type business structures that are conceived from the very start with the global market in focus. According to Isenberg 2008 the "born global" model implements a strategy that is characteristic of the new breed of entrepreneur thinking across borders – from day one. There is no strategy-making apprenticeship in the traditional moving from their original SME size, to exporting firms, and finally to the multi-domestic status as illustrated in Figure 2.81.

SME strategy-making can effectively use the "leap-frogging" approach on the pathway to accelerate their graduation into using the productivity-enhancing strategies and resources that have been traditionally limited to multi-national deployment. With the Born-global Model, the SME strategies would still recognize and retain the value-giving components of the 100 year - $1 Trillion knowledge-base, but not be limited to its step-by-step timeframes.

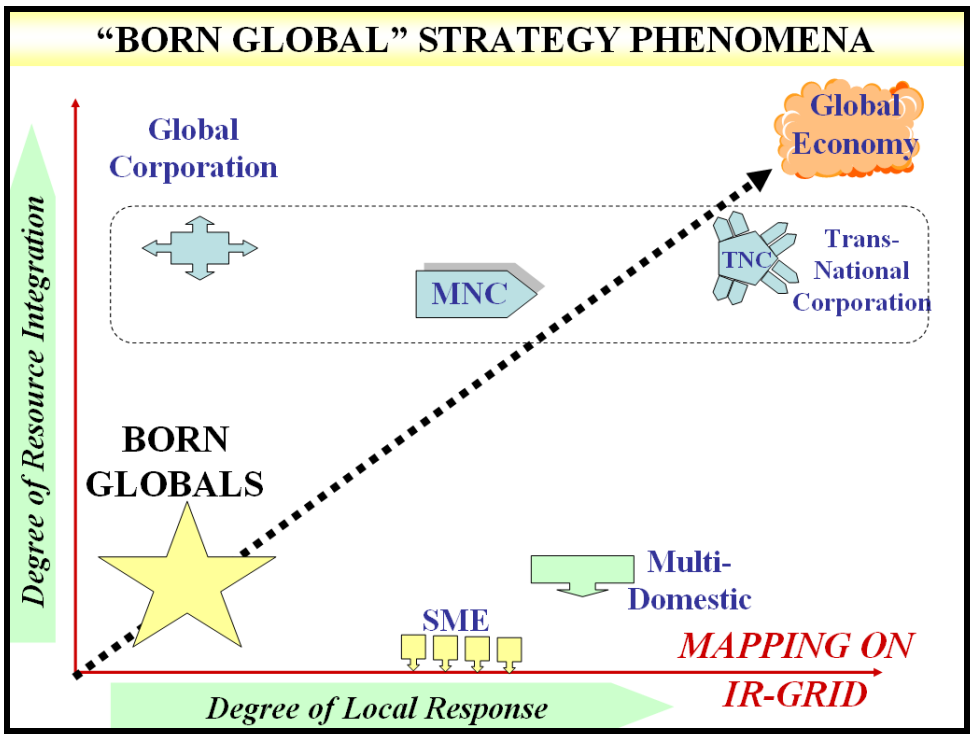

Figure 2.81 – Born-global business model for inspiration in SME strategy-making.

As illustrated, the Born Global is characterized by:
- Strategy captures resources and customers from around the world
- Technologies used to overcome distances
-Strong alliance development with the required business ecosystem
– Digital and virtual partnerships that include global firms and multi-nationals
- Resource procurement and resource mobilization at the rate which fits with the required time-frame of a fast-track strategy implementation objective.
- Characterized by a "diaspora" element, in which resources across continents are strategically integrated by ecosystem members who share common values

– Accessing and tapping into formal and informal groups and networks
-Strategies aligned to a common global purpose, to which the world can relate
- Delivering value propositions or benefits that have been rarely offered to the global or emerging markets
-Social Networks are providing strategy-making guidance for the creation of new enterprise offshoots and expansions

Luostarinen and Gabrielsson (2006) provide further insights into the requirements for success in Globalization. They recommend marketing strategies that can deliver a direct response with the speed required for products that are intrinsically limited to short product life cycles. The entire package as well as the financial resources and equity investment for its implementation need to be fine tuned and aligned with this "meta-approach". .

Gabrielsson (2005) has proposed a range of branding strategies for Born Globals and have noted that Born-globals are themselves subject to economic up-turns and down-turns. During the downturns they may need to revert to the conventional approaches.

The lessons for SME strategy-making that may seek to emulate Born Globals may benefit from the research by Knight, Cavusgil and Tamer (2005) who have produced a taxonomy of Born-global firms. Also research by Rodan and Galunic (2004) offeres strategic perspectives on the networking structure and how knowledge heterogeneity would need to be embedded within the collection of enterprises supporting the "Born Global: firm.

2.5.11 The Prahalad "Innovation Tree"

Most SMEs who are strongly rooted in practical issues would be attracted to the building of unified strategies that are based on the mixing of competencies to generate core products and innovations. Prahalad's "tree of knowledge"
Reframing SME strategies based on the "tree of knowledge concept" but adapted to satisfy Core Value Propositions could therefore be well received by SMEs.

The concept of the "Innovation Radar" model would similarly be well accepted by practical-oriented SMSs. Sawhney, Wolcott and Arroniz (2006) have developed the concept of an "Innovation Radar" model based on three years of research and discussions with MNCs such as Apple, Boeing, DuPont, eBay, Fedex, Sony, GE, Siemens, Home Depot Inc, Nissan Motors, Motorola, Virgin, and Microsoft.

The resulting lessons that have been captured and adapted from the Innovation Radar Model, confirm the validity of the Knowledge Ecosystem Model. These involve:

(i) The focus on Customer Value Propositions, which should be the starting point, offering new value propositions and not new things. The Knowledge Ecosystem's Schema not only directs the attention of the members to this focus, but it also provides assistance with the heuristics needed to develop globally relevant Customer Value Propositions.

(ii) The use of Knowledge Assets and perspectives. The Knowledge Ecosystems offers a portfolio of concepts such as platforms, co-created customer experiences, chains of total solutions, and fulfilment systems and cycles.

(iii) The use of re-framing and re-combination strategies for innovation capture and new product development. Re-framing being is a key element of the Knowledge Ecosystem Model. It seeks to assist members by re-defining and integrating their core competencies, core capabilities, co-creations, and co-configurations of the members into new re-combinations for innovation and new product development.

(iv) The need for project specific collaboration. The Knowledge Ecosystem Model seeks to facilitate such collaboration over the entire project life cycle, through the design of the social epistemology within the Knowledge Ecosystem Model; and

(v) Integration of theory and filed knowledge. This is specifically captured by the use of the Management Innovation Crucible segment of the Knowledge Ecosystem Model.

The practical appeal for SME strategy making with the "innovation radar" is the logical nature and logical progression that characterizes the direction points of the radar-innovation progression metaphor.

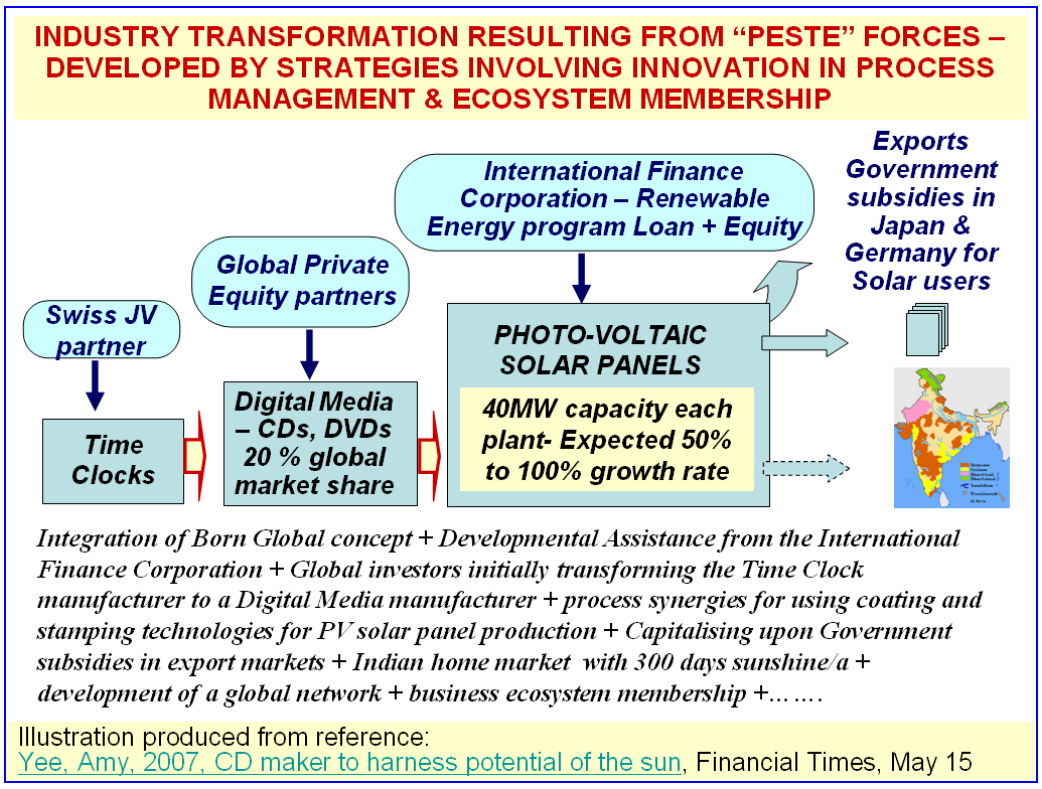

Figure 2.82 – Lessons from the concept of the "Innovation Radar" for SME strategy-making

In Figure 2.82 for example, the development of a joint venture between a Swiss company and an Indian SME illustrates the progression and transformation from a niche producer to a globally significant specialist manufacturer. The Radar specifically has utilized guiding points for the acquisition and mobilization of technologies and funding resources.

SME lessons to be gained include the potential for partnering with MNCs for mutual benefit in the long term, and for logically linking business stages of development through a common or related set of technologies. In the case-study illustrated, this common thread was the technology that controlled the precision depositing of fils or membranes. In the initial case this involved layering for CD and DVD digital media. In the current stage the layering involves the application of "phot-receptive' cells that generate solar photo-voltaic power.

2.5.12 Capitalize on the Web Trading Platform

It is logical to also question whether Post-2000 SME strategy-making should focus on the new public-domain web infrastructure that is created by institutions such as Google, eBay and Yahoo etc. Trading platforms such as the eBay system for example offer the producers and sellers of goods to use their on-line trading infrastructure with exposure to the global market place. Although there are limitations on the platform as further detailed, it none the less presents opportunities for connectivity between SMEs and global markets.

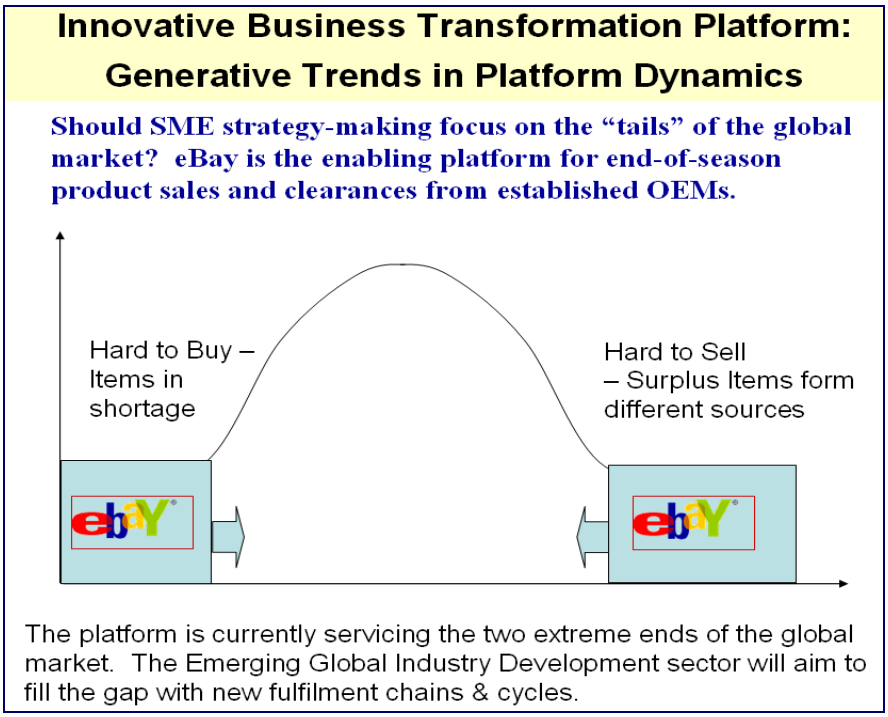

Figure 2.83 – Strategic issue of linking SMEs to global trading platforms

Figure 2.83 illustrates the epistemic space that is provided and made available to SMEs by the eBay web trading platform. In normal businesses, the centre-zone of the "Bell" distribution curve is generally commandeered and monopolized by the OEMs and Multi-National Corporations. They generally organize their production on the basis of predicted stock levels, and manufacture to stock, based on marketing projections for each season. When these projections overshoot the demand, the OEM or the MNC is overstocked with a product that can sometimes be subject to rapid obsolescence. Complicating this over-supply problem is the need

for their production and the partially filled supply chain pipeline system to be re-configured for the new season's demands.

SMEs generally have the opportunity to capitalize on the weaknesses of the OEM-MNCs "manufactured-to-stock" industry practice by developing a SME strategy for long-term disposal and support services in the required re-configuration. A second strategic approach is to develop strategies with relatively unknown OEMs and attempt to service the middle ground.

2.5.13 Macro-economic Opportunities to SME

SMEs can benefit from the range of industry reports and white papers on "Candidate exemplars" for the combination of Business ecosystem development with Mass Customization initiatives or strategies delivered by international government agencies.

The constant challenge facing SMEs is the mobilization of resources required for the development of innovations, or for business expansion, or for participation in opportunities being presented that need a higher level of local service delivery. Multi-National Corporations (MNCs) overcome this challenge with the availability and access to funding lines from their respective Government Agencies for the export marketing of their new types of equipment, technologies, or product services.

Figure 2.84 and 2.85 illustrate the innovative manner in which the needs of both MNC and SMEs can be simultaneously satisfied. It is an example of the classical bringing together of the common interests of Multi-nationals, Governments and groups of SME firms working in developing countries.

It also explains the functioning of a "meta-strategy" through which the Japanese Government seeks to bring together a purpose designed business ecosystem, in which individual membership of local SME firms and Japanese-based MNC firms simultaneously receive benefits while contributing to the common good and the developmental assistance goals of the local host and the Japanese Governments. In the example illustrated, the Japanese Government's Export Credit and Developmental Assistance that is normally made available to developing countries is innovatively re-framed to facilitate the development and expansion of globally relevant business ecosystems. Developmental assistance grants and low-interest loans are made available from the Japanese Government through an innovative system whereby each group of recipients utilize the available funding to enhance the work with and enhances the levels of service that can be delivered to members within an ecological framework.

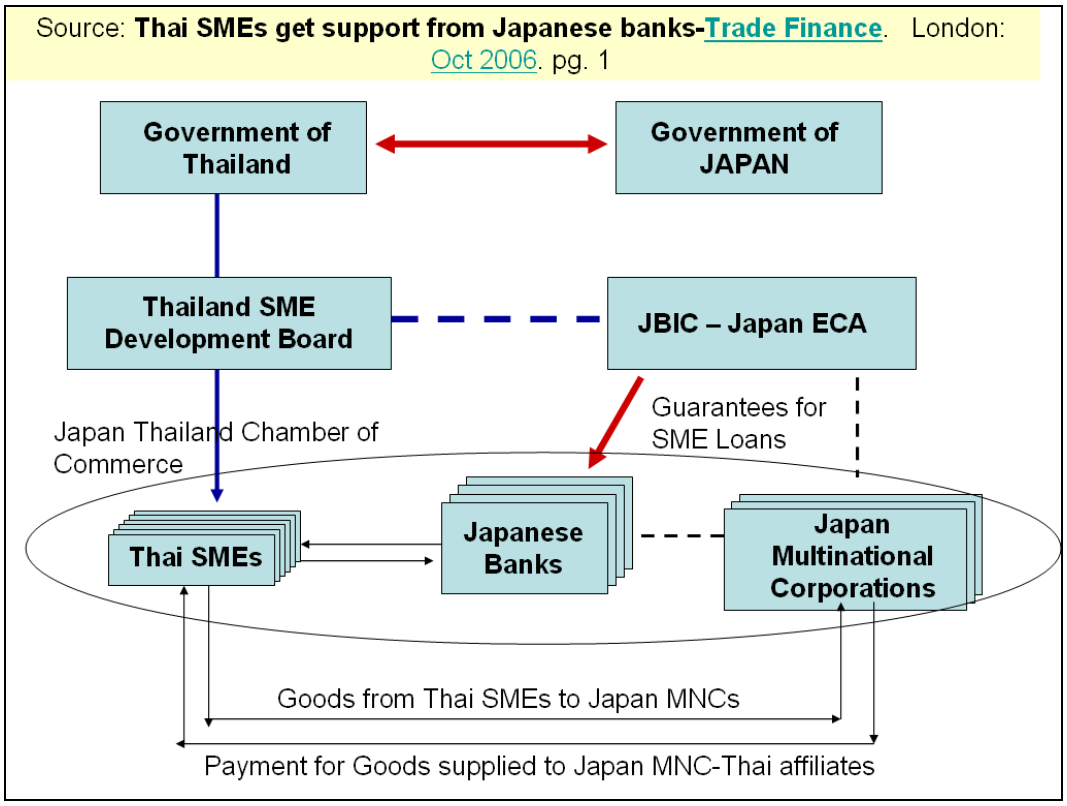

Figure 2.84 – SME strategy making models to leverage available international developmental assistance funding

The Strategy underpinning the development of the Export Credit System is the building of suites of parallel relationships between counterpart organizations to be responsible for segments of the export credit utilization system. The parallel counterparts between Japan and the developing nation are best able to be aware of the needs of their counterparts and their role in the advancement of the export-credit business ecosystem.

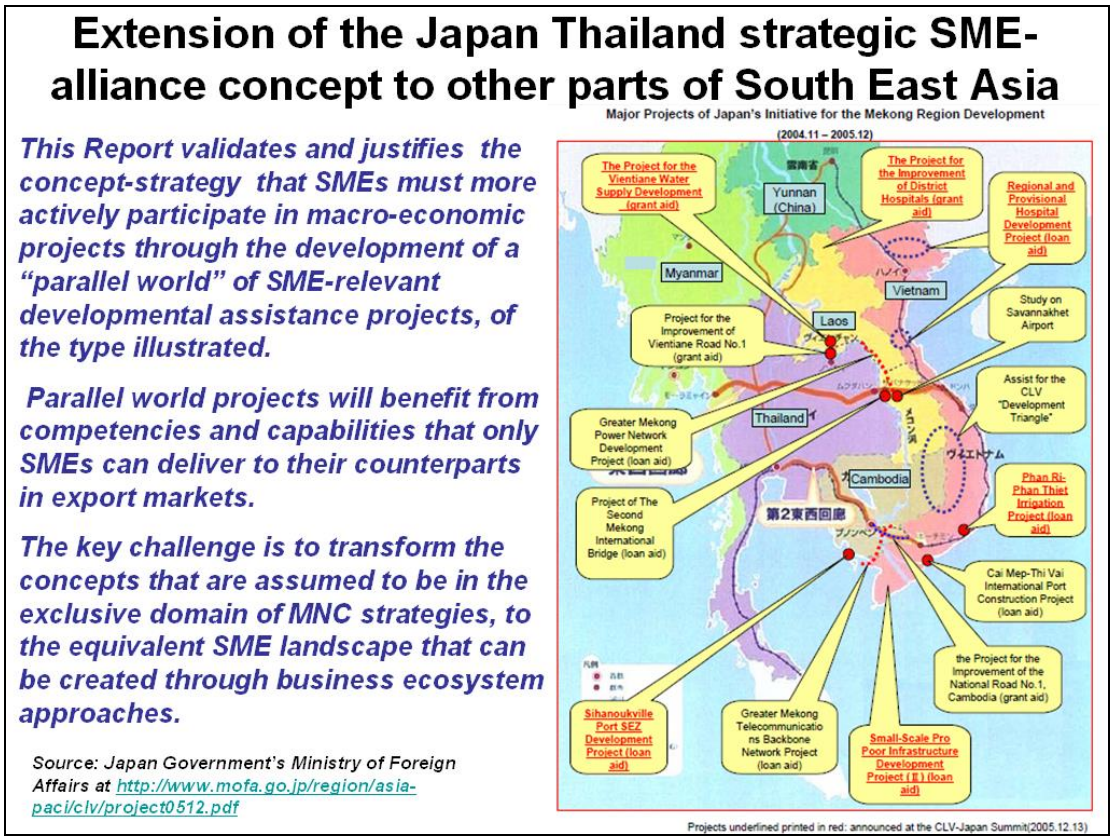

Figure 2.85 – Hybrid strategies for SMEs to become engaged in global developmental assistance

Figure 2.85 illustrates the "parallel knowledge-sharing and common understanding" that also needs to be developed between the 2 groups of bankers, industry associations, and SME-OEMs and the "developmental assistance" receiving communities. As illustrated, each of these parallel knowledge-sharing groups develop their respective segment of the overall business strategy under the umbrella of an overriding strategy for the business ecosystem. For example Japanese OEMs needing Thailand SMEs to upgrade their levels of products and services to meet the demand of specific local community groups. Effectively they would be the prototype for expansion into the global economy. The joint activities would be the natural spring-board for the achievement of quality and productivity standards. In the future they would be also offered in contracts for Thailand SMEs to function as a contract manufacturer delivering Tier 1, Tier2 and Tier 3 products and services to the Japanese MNC. As part of their overall strategy, the SMEs are advised of the availability to purchase and install Japanese-made production equipment for the upgraded manufacture of the new components required for global markets.

The second set of parallel groups, ie. the Bankers, knowing each other's modus operandi, make finance available to the Thailand SME for the purchase of the Japanese manufacturing plant required by the SME. Under the overall cover of the Japanese Government's export credit facility, the required loans are established. Both groups are secure in the knowledge that the export credit loans being made to Thailand SME are secure in the knowledge that expected re-payments of the loan will be made by the SME, from payments received from the Japanese OEM, from the on-sale of their value-added end-products being marketed to the world.

A final parallel group of mind-sets involve the "business associations" in the two nations. As industry associations they provide access to their membership base and are able to efficiently transmit messages and provide learning for the opportunists available from export credit and trade finance being offered by the Japanese Government. Industry conferences and meetings present the advantages of the export credit-developmental assistance packages to the stakeholders, thereby marketing the program through highly influential and credible voices.

The net result of this strategy-making capacity is that a "Mass Customization" strategy is effectively in place, with no one single persons being acknowledged as the leader or the project developer.

A further variation and expansion of this concept of Mass Customization with Hybrid Developmental Assistance is illustrated in Figure 2.85. The key challenge with such reporting of macro-economic activities taking place in the global market is the re-framing of the reported projects into a parallel world of SME relevant opportunities. The macro-economic projects are generally considered the natural domain of the Multi-National Corporation (MNC) and the challenge is to change the context into a parallel world in which SMEs could offer their own portfolio of core competencies and capabilities, to mimic the MNCs pathway into export markets.

Australian SMEs can learn from this MNC strategy-ecosystem exemplar because the availability of export credit and developmental assistance is similarly available from the Australian Government, as with the Japanese Government stakeholders. The challenge is to be able to re-frame and re-populate the business ecosystem exemplar.

The validity and power of the business ecosystem and the re-framing and replication potential of the model can be observed through the needs of the population in the export markets which are the counterparts of the parallel SME client-base in Australia.

Growth Development Platforms

A key industry-generated strategy is the use of "Growth Development Platforms" in which a facility or opportunity is managed in stages and through joint development of a business ecosystem, and the creation of "critical mass" with self-generated growth taking over after.

SME strategy-making needs to identify the patterns of economic activity that involve Growth Development Platforms. Figure 2.86 for example presents the opportunities for Thailand-based SMEs to critically evaluate opportunities for their growth. The lesson for Australian SMEs would be to similarly evaluate the Mining and Energy resource development projects.

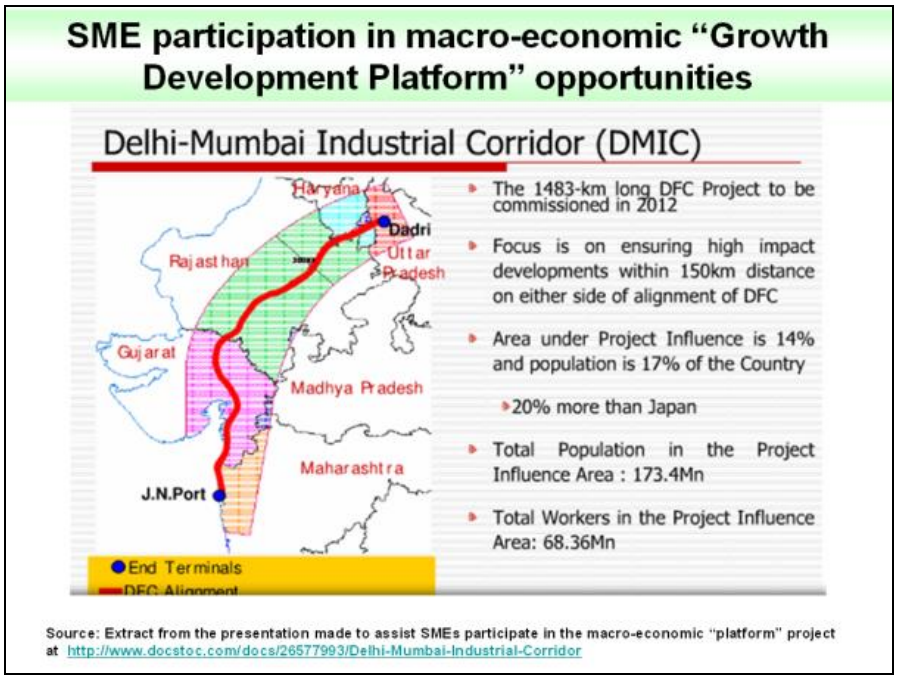

Figure 2.86 – Lessons for "Niche market" opportunities within mega projects

While PESTE business environments are different between Australian and developing nations, the concept of the Growth Development Platform can also be utilised in the micro-industry level.

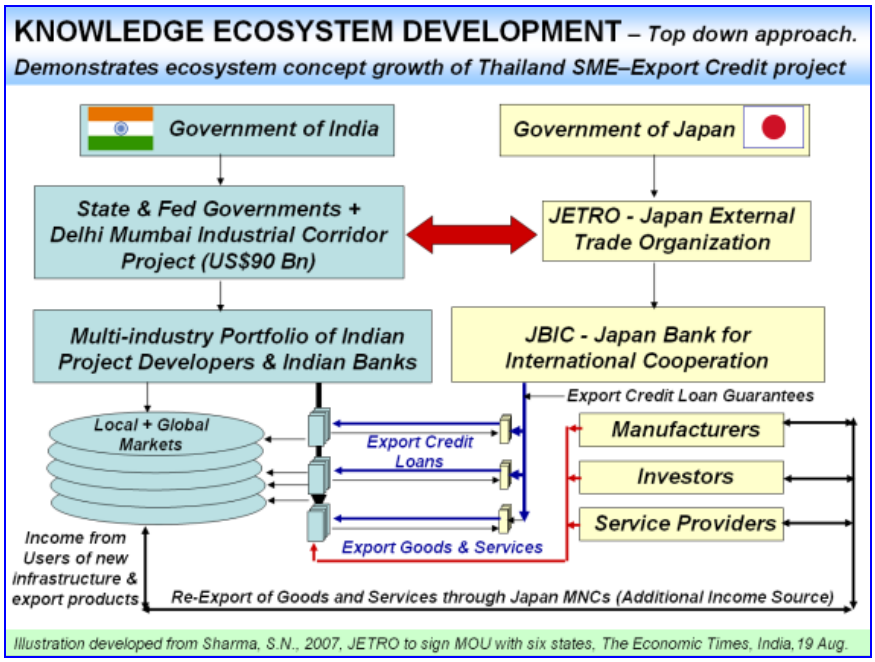

Figure 2.87 – Strategy-making lessons from SME involvement with multi-national and government sponsored projects.

In Figure 2.87, it is clear that the focus of the business ecosystem in such a Growth Development Platform strategy being created for infrastructure development in India. While the Japanese Government is also involved in this global strategy exemplar, the objectives and outcomes of the strategy are not the production of Japanese OEM value added goods, partially manufactured in

Thailand by their local SMEs. In this case, the product-service outcomes are physical infrastructure systems – the earthworks, the buildings, the roads, the bridges, the rail crossings, the toll-repayment systems, and the safety systems, etc. Together they make up the vital needs of India, as an emerging market with significant potential for growth. The Japanese business ecosystem have chosen the prestigious Delhi-Mumbai "Developmental Corridor" as their strategy growth development platform. Again parallel systems are being brought together, between the organizations belonging to the export credit financing nations and the end-users of the export credit finance.

2.5.14 Critical Evaluation

Strategy-making challenge with Industry Systems - Clearing the fog of global innovation and macro-economic programs and opportunities.

From the above it is clear that a major distinction exists. SMEs are the business minnows and may appear to have an end-game role. The role for SMEs appears to be limited to pick up the virtual crumbs from the table of big players in Government and among Multi-national Corporations. While this is generally true with the developments of high intensive capital works programs (and broad acre agriculture and high technology research and mass scale production facilities), a parallel world exists for SMEs.

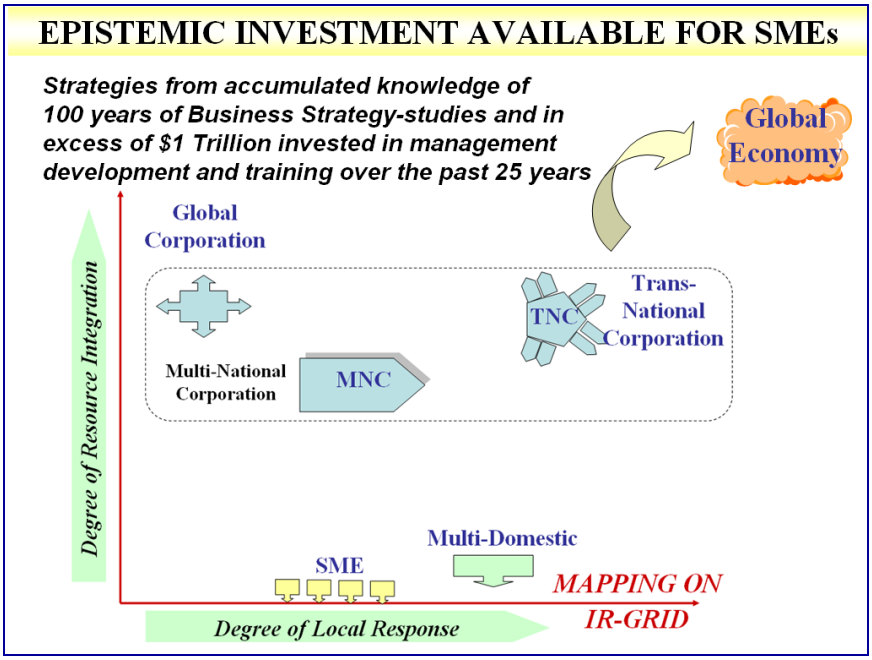

Figure 2.88 – Epistemic landscape for deconstructing MNC strategies and re-constructing Post-2000 strategies.

The challenge for SMEs is to remove the "fog" and the old thinking that SMEs cannot expect to participate in such programs. The key differential is that SMEs possess strength in numbers and the mobilization of their numbers from causes that will benefit them individually and collectively is the strategy-making challenge.

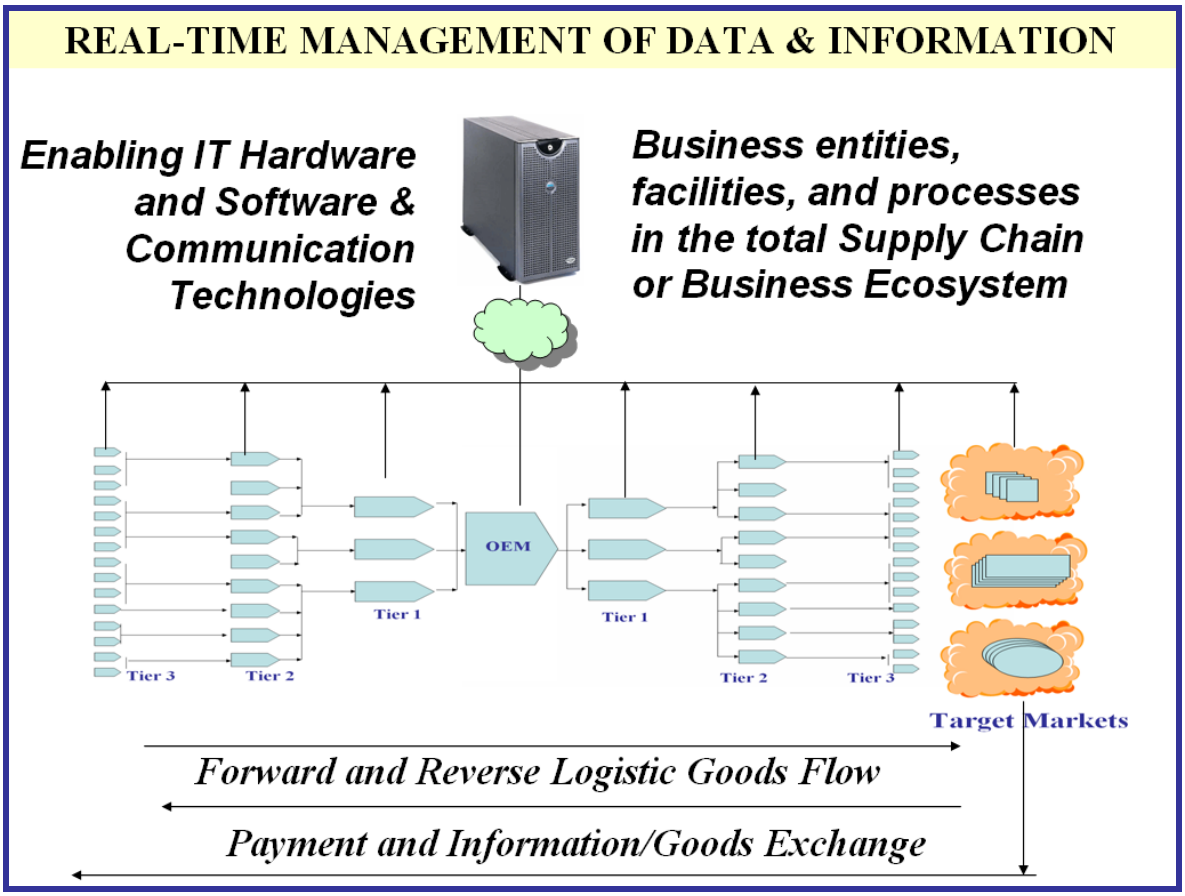

Figure 2.89 – Strategies framework for SME organised digital business ecosystems

The challenge for SMEs is to integrate the insights from Pre-2000, Post-2000 and their different domains from which their portfolio of strategies have been generated. In Figure 2.89 for example, innovations are being crated from the mixing of the Pre-2000 supply chain network concept with the capabilities of the Post-2000 Cloud computing.

The power and value of the new hybrid concepts results from the control of the Mind. In Figure 2.89 for example, the visibility provided by Post-2000 Cloud-computing can and does exercise the strategy-making mind. As a result, the strategist can introduce innovative additions into the hybrid vehicle and it process management systems. Real time information extracted from the inventory or stock levels of the intending buyer or end-user can specifically set off a series of innovative actions.

The Epistemic Spectrum created by and for MNC enterprises

Professor Kenichi Ohmae, a world reknown strategy-thinker argues that there is no model to describe the global economy because there are so many parameters, variables and "units of economy" that have changed the strategy rule book. For example Ohmae argues that advances in

information technology have changed the tenants of strategy and inventory management. Firms such as Toyota and Dell demonstrate their "just-in-time" version of inventory management models that respond to orders not to arbitrary stock target plans. Figure 2.90 represents the aggregation of such strategic game-chaining concepts as com,ponents within an Epistemic Spectrum

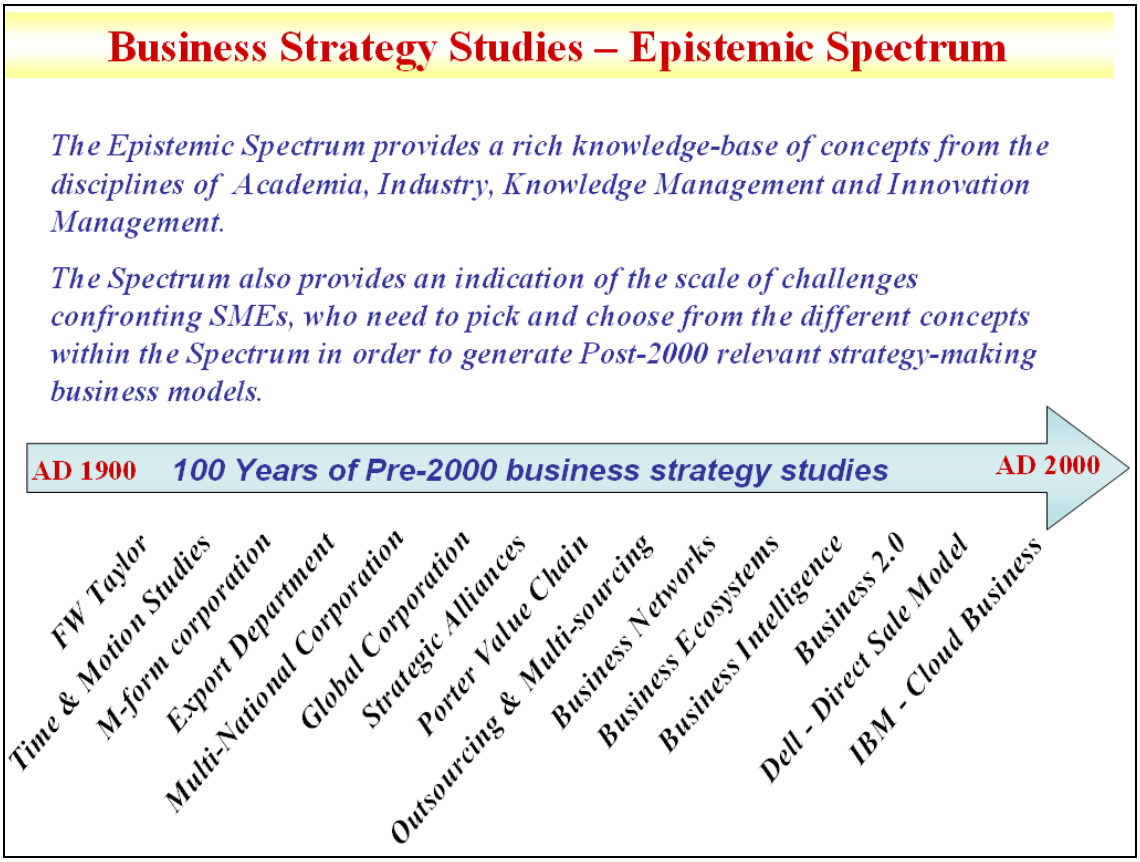

Figure 2.90 – Strategy-making framework for the SME mindset and management of the spectrum

Search for building blocks and Representations of the range of building blocks to resolve the complexity

The more the business challenges presented by the landscape of Emerging Global Industries (EGIs) the more it is that new business models and concepts are created. Also the greater it is that complexities develop confronting the SME with doubts on system-choice, resource-requirements, technologies, relevance, time-frames for action, life-cycle consideration and competitive response, . For example in the lower portion of the diagram, SMEs have a range of options like creating Strategic Alliances, or Business Ecosystems, etc, and the key factor is “with whom or with what?”.

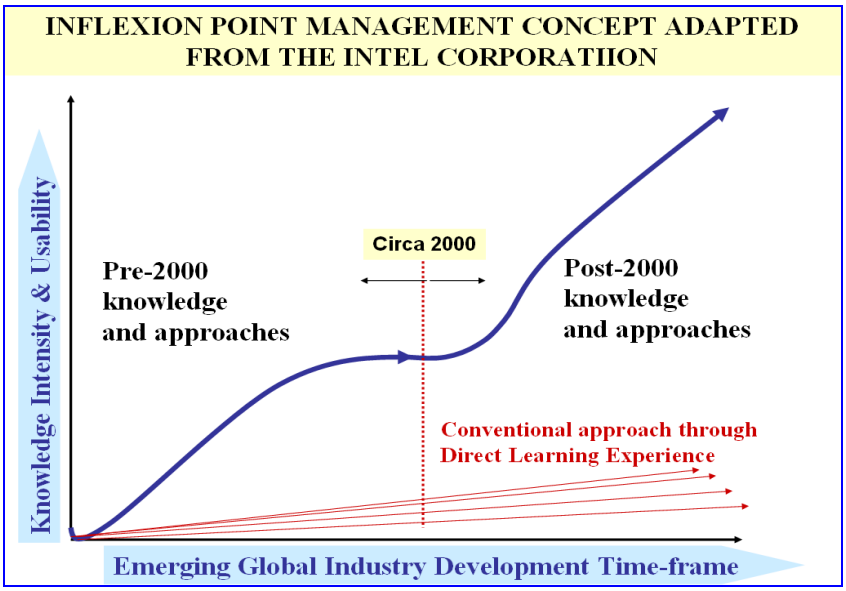

Figure 2.91 – The new mind-set for SME strategy-making in Post-2000 landscape.

It can therefore be argued that the Epistemic Spectrum (created by, of, and for MNCs) may indeed require a new approach to manging the spectrum as illustrated in Figure 2.91. A new shift in thinking and in the Mind-set of the SME are therefore required for SME strategy-making. The intervention of the Mind and its epistemic processes appears to be mandatory requirement. The continuous rise of the curve in the Post-inflexion point of Figure 2.91 (right corner of the diagram) and the dynamics of the growth path can only be attricuted to the actions of the collective "global mindset".

The dynamics of the continuous growth can be further explained because the dynamics of the PESTE–macro–economic forces are themselves the subject of global mind-sets. It is natural that the re-shaping of the Post-2000 EGI business environments and landscapes (by PESTE forces as a direct or indirect result) are also the direct result of the collective dynamcis of the "Mind-sets" of political leads, government agents, entrepreneurs, and decisions makers in the market.
The meta-strategy for SMEs is therefore to align themselves and their business ecosystems with the collective eGID mind.

2.6 Critical Evaluation of the Literature review

In the section, we give critical evaluation of each of above discussed literature segment, namely:

(i) Theoretical-oriented Business Strategies
(ii) Technology-enabled Business Strategies
(iii) Knowledge-based Business Strategies
(iv) Innovation-driven Business Strategies

2.6.1 Critical Evaluation of theoretically oriented Business strategy-making

The following critical evaluation of above theoretically oriented Business strategy-making concepts confirms the expansive, confusing and complex nature of the strategy-making building

blocks. An accurate metaphor of this complex and its possibly confusing situation are summarised by Ahlstrand, Lampel, and Mintzberg (1999) who compare the SME challenges in strategy-making to the proverbial situation of "the blind men and the elephant". Each person provides a partial description of the elephant based on their limited knowledge and their different perspectives on life.

If SMEs are to successfully utilize these resources a "meta-level" of cognition will be required to overcome the differences that exist with each of the model system being offered. SMEs will therefore need to meta-manage and create meta-strategies that allow for differences and allowances to be made in eGID focused strategy-making. In their current "native" format the strategy-making building blocks are relatively disparate and isolated based on their differences associated with:

(i) The structure of their concepts
(ii) The source and disseminating mechanisms
(iii) The scope and scale fo the issues addressed
(iv) The context of the target and the starting position from which they need to be achieved
(v) The Core competencies and the core capabilities and the core-creative propensities that are available to the SME
(vi) The resource landscape and the relative distance from the eGID expectations on innovations and participation.

In addition significant variations exist among the strategy-making building blocks that have been presented. Differences exist in their Business Organizational arrangements, the Marketing challenges, the Competitive Positioning and landscape, and the project and product life cycle perspectives of the different models and concepts. SME strategy-making will also need to account for the major differences under which the models have been assumed to manage the varying PESTE forces and the issues of Governance, Risk and Compliance.

2.7 Summary of the literature of Pre-2000 and Post-2000 Business Strategy-Making

The Chapter commenced with the context of the emerging Global Industry Domain (eGID) and the research agenda involved the need for SME participation with strategy-making skills in order to generate innovation and business success in emerging industries. The Chapter recognizes that no significant body of information or knowledge exists that is exclusively focussed on this SME perspective. All that is available is the bulk of strategy-making concepts and building blocks that have largely been developed for and in the context of their use by Multi-national Corporations.

In the context of developing a paradigm or approach that could be directly utilized by SMEs in their quest for strategy-making, the choice was made to evaluate the Literature of the MNC strategy-making concepts and constructs and to thereby determine their relevance for the construction of a SME focussed new paradigm. The Review process developed a methodology that presented the strategy-making building blocks into 4 categories:

(i) Theoretically-oriented constructs that have largely been the teachings of academia in the Strategy-making course of the MBA and undergraduate degrees in business studies and commerce

(ii) Technology-generate or technology enabled strategy-concepts that offer opportunities for SME strategy-making in their own right and in combination with the concepts forming part of the academic coursework

(iii) Knowledge-based strategies that have resulted from the Knowledge Management Movement that commenced in the 1990s, with Drucker's terming of the economy as the era of knowledge and knowledge workers

(iv) Innovation-focussed strategy-making that similarly arose early in the 2000 era, with a focus on directly achieving the fruit of good strategy-making.

The "Theoretical-academic" category of strategy making can generally be associated with the Pre-2000 era of Multi-national Corporations and in times when the PESTE forces were less dynamic and less prone to change with velocity. In this relatively static period, strategies created possessed a relatively long use-by date and were never in danger of being rendered irrelevant due to the changes taking place in the business landscape. In the macro-economic landscape, the PESTE forces were in effect relatively stable – with the era of fixed tariffs, licenses to manufacture and limits on the hiring and discharge of workers.

In summary therefore SME strategy-making needs to focus on two key factors:

(i) The need to actively manage the integration of the "Mind" and its innovation creation potential with the full complement of Pre-2000 and Post-2000 models, concepts, assumptions and technological platforms
(ii) The Mind-managed integration of the above with a focus on sustainability.

Figure 2.92 again presents the concept of the "Tree of Innovation". Its epistemic (power and value lies beyond the simplicity of the metaphor). The new Post-2000 competencies, capabilities, co-creations, etc require "root-zone" nurturing of the "Minds" of ecosystem members, stakeholders and end-users. The "Mind-root" gone management requires the same knowledge management portfolio of nano-scale controllers that were identified and presented in Figure 2.64.

The knowledge-controls and conditions of state and bio-epistemic representation need to be actively used as the epistemic nutrients for the new "Mind" root zone of Figure 2.92. A strategic and structured approach needs to be developed if the innovation harvest is to be rich and sustainable.

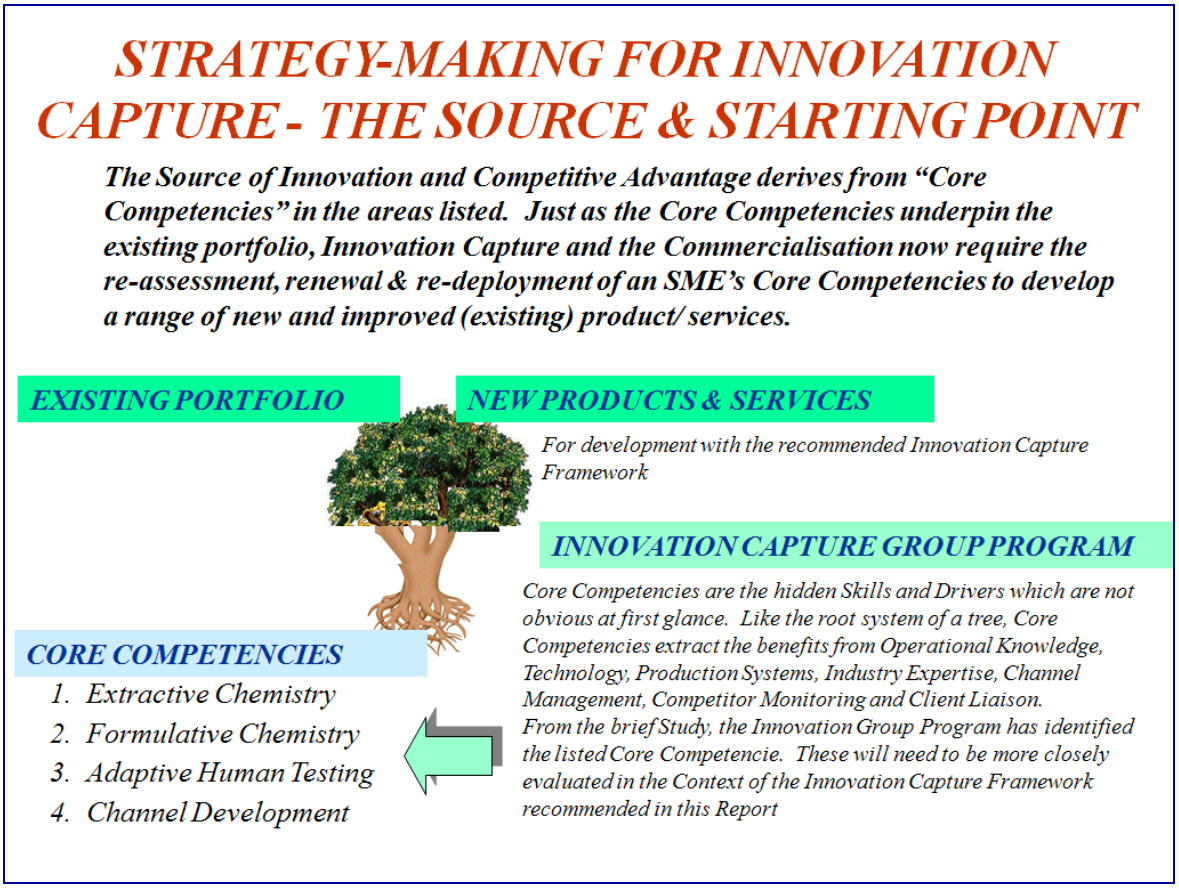

Figure 2.92 – The universal strategy-making metaphor that can transcend industries and epistemic frames

2.8 Evaluating the literature as the DNA of Business Innovation

The review of the literature, we believe presents a comprehensive representation of the Pre-2000 and Post-2000 models and building blocks that directly relate to strategies for creating and participating in Emerging Global Industries (EGI) . It's concepts sourced from Academia, Industry-Technology, Knowledge Management and Innovation Management have been selected because they directly relate to the demands and the dynamics of the EGI landscape. The use of literature that focused on SMEs only would have suffered a structural deficiency because it

would not have necessarily covered all of the EGI issues of hyper-dynamics, scale, scope, and global collaboration and competition.

The demonstrated concepts therefore offer an almost unlimited potential for SMEs to consider in their goals of participating and succeeding the emerging Global Industry Domains (eGID). This is despite the fact that the concepts were primarily MNC focused in their original form – by MNCs, of MNCs.

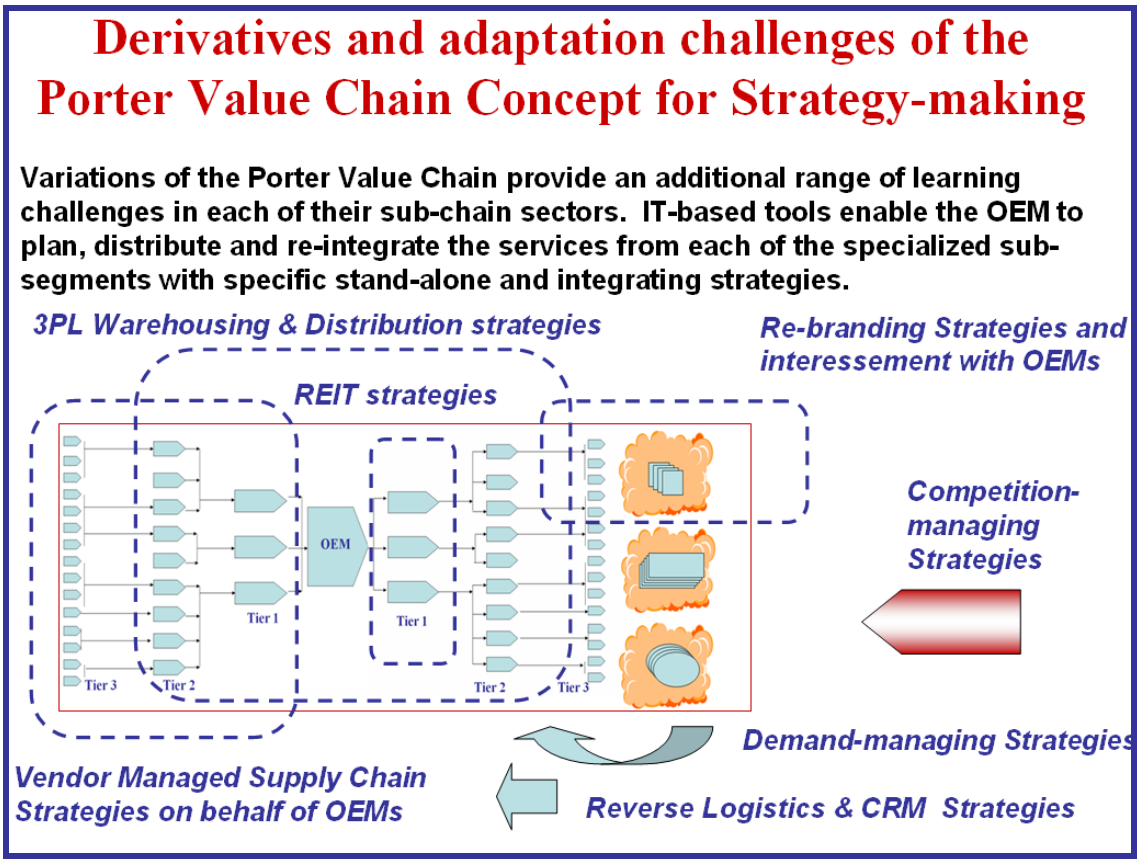

Figure 2.93 – Derivatives and variations of the supply chain network

Challenges however exist forSMEs to develop mechanisms to leverage these EGI-relevant resources into SME-relevant epistemic pathways. Figure 2.93 illustrates the challenge and the epistemic dilemma faced by SMES and their need to achieve a combinatorial leveraging of Pre-2000 models with their Post-2000 examples to develop EGI type activities. In this context, the Chapter has introduced one of the most obvious "meta strategies" required for the success of this combinatorial-leveraging pathway. It is the concept of the considering the role of the "mind" of the business ecosystem membership – at the individual and collective levels. It is the new mind-sets that have in-fact generated the multiple variations of the 1970s-era Porter Value Chain to deliver the richness of new business innovations illustrated in Figure 2.91.

Our critical evaluation of the literature specifically presented the case of the deployment of new mind-sets as being the key challenge that once fulfilled could better manage the demands and dynamics for creating opportunities in emerging global industry domains.

Importantly we also directly linked the Mind with the characteristics and dynamics of the EGI as the creation of the global mind-sets. We also argued that the eGID sector sectors dynamics are indeed the result of the changes imposed by the Mindsets that govern, shape and control the macro-economic PESTE forces.

Our review of the Literature has therefore introduced a depaerture in the epistemic approaches taken by conventional Strategy-making education and training (including that for SME audiences). In Pre-2000 approaches to strategy-making these Political, Economic, Social, Technological and Environmental (PESTE) forces are generally considered in isolation, as a phenomena. PESTE are considered as the great "given" that needs to be accepted for which "work-around" strategies are needed for success in their specific geographical or territorial domains . In this Chapter however, it has been argued that the PESTE forces are nothing other than the collective forces of the mind-sets of the persons or specialists or the experts that populate and govern or control the PESTE forces – directly or indirectly.

The Chapter further argues that a new dimension is required in strategy-making and that it should therefore be referenced to the mind-sets of the EGI business ecosystems. The Literature Review in the Chapter has genrated an extension on the research context from beyond simple awareness of the building blocks to the need for mobilizing new mindsets for SMEs engaged with the strategy-making building blocks.

This change in context and the extension of mindfulness beyond awareness does however require a firm knowledge-base for any "mind-focussed" transformation to EGI.. The epistemic-mindfullness situation is however one of the proverbial "chicken or egg" dilemma. The evaluation of the Literature has confirmed the existence of a clear need for the Pre-2000 knowledge-base to be "Mind-mastered" – before similarly "Mind-mastering and Mind-integrating" the Post-2000 transformations for strategy-making. It is only then that SME-relevant and EGI-relevant strategic insights can be created. The research challenge therefore also involves – (a) Learning how to ensure that SMEs would be able to accept the Pre-2000 models and concepts without discounting their legacy-base and age, and (b) how to integrate the dated Pre-2000 with the modernistic Post-2000 literature.

2.9 Conclusion

This Chapter has focused on the strategy-making and conceptual building blocks that SMEs would need to consider in their quest to create innovations, and grow their business and create new sectors in the emerging global market place. The Chapter has presented the conceptual building blocks in a structure that is largely based on the source of the concepts. For example, in the first segment, ideas and concepts from Academia have been presented to represent the theoretical concepts and the frames that have been used over the past 100 years. The other sources are from Technology in Industry, and the Knowledge managaement and the Innovation Management domains Essentially they represent a Knowledge Spectrum with generic and time-neutral strategy-making resources. Such Pre-2000 knowledge has not been made redundant or superfluous while others represent variations or adaptations of the generic themes. Together they represent the epistemic "exoskeleton" of the most comprehensive knowledge-base that can be transformed, adapted, and enhanced for EGI relevance with the superimposition of Post-2000 perspectives of Technology, Knowledge Management and Innovation Management.

In the Chapter 3 that follows, an attempt is made to define these problems in the context of research questions and possible solutions that mobilize the human "mind" to bring about the required transformation for SME and EGI relevance.

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CHAPTER 3 PROBLEM, UNDERLYING ISSUES AND RESEARCH QUESTIONS

3.0 Introduction

Chapter 3 addresses the research-problems confronting the utilization of eGID-relevant knowledge from the collection of knowledge elements or epistemic spectrum that was preented in the Literature Review of Chapter 2. In Chapter 3 the focus is on whether this epistemic spectrum can be utilized for SME strategy-making despite the spectrum's status of not being in a "ready-to use" condition . Chapter 3 persists with the utility challenges because it acknowledges that the spectrum is the only available, wide-ranging, and comprehensive epistemic platform that focuses on eGID-enabling resources. The challenge therefore is to use the contributions being made from both the Pre-2000 and Post-2000 eras, each with their respective perspectives, models, and approaches for SME-generated innovation and global success.

Problems of scale and scope confront SME-strategy-making in the context of utilizing Chapter 2's epistemic building-blocks which were largely created by, for and of Multinational Corporations (MNC) perspectives.. Epistemic challenges faced by SMEs therefore range from the limitations of the SME native knowledge base, their comparative disadvantage in being able to utilize MNC-monopolized strategy-making building blocks, resource mobilization, and the relative epistemic distance and economic realities separating SMEs from eFID and MNCs from eGID. Further SMEs need to develop mind-sets to obtain operational integration with the mind-sets of the stakeholders shaping the emerging global business landscape (eGID).

Chapter 3 concludes by establishing the need for SME-contextualized learning to overcome the over-arching epistemic challenge of managing the selection, absorption, convergence, adaptation, transformation and integration of the MNC-resources, with SME- relevant thinking - over the entire knowledge spectrum composed of Pre-2000 and the Post-2000 building blocks.

3.1 Definition of the Terms and Concept used in this Chapter

EGI and eGID – both relate to the Post-2000 era business landscape. EGI refers to the new opportunities for streategy-making to participate in the emerging global industries. eGID (emerging Global Industry Development) is a subset of the EGI objectives that relate to the SME goals of creating SME-relevant developmental pathways for project-specific target sectors

Epistemic building blocks – these are the strategy-making models, frameworks, structures, approaches, and contractual arrangments between and within firms in their attempt to access global markets and eGID in the Post-2000 era

Differential knowledge-base – this is the structural differences in the epistemic resources between the SME when compared with that of the Multi-National Corporation (MNC)

Differential learning – this is the structural differences between the SME and the MNC in their differentail capacities, competencies and capabilities to absorb and utilize the knowledge embedded within the epistemic building blocks for strategy formulation, resource mobilization and eGID implementation

Enterprise learning – relevant to the SMEs capacity to access, evaluate, adapt, integrate and implement the lepistemic resources within its organizational structure and its extension within a business ecosystem

Epistemic model – is a system or framework that transforms input epistemic resources into commercially relevant pathways and innovative products and services that can be traded within the eGID landscape

Epistemic system – is the or approach that underpins the integrity and validity and usability of the epistemic model and thereby ensures on-going relevance to the changing nature and dynamics of the Post-2000 eGID business landscape

Knowledge spectrum – refers to the aggregation of strategic building blocks with a structure that recognizes their chronological sequence, functional relevance and scale and scope for participation in Emerging Global Industries (EGI)

Structural dissonance – is the differences in the range of issues, approaches, capabilites and competencies, etc, that prevent SMEs from readily utilizing the parallel categories of resources for the formulation of SME relevant pathways to eGI participation

3.2 The Problem with Convergence and Mobilizing the Internal Knowledge Resources

The Literature Review of Chapter 2 provided details of the building blocks, as well as indications of the context and time during which they were conceived predominantly these building blocks were created in the Pre-2000 business area. Also they were almost exclusively developed in the context assist multinational corporations to expand and grow.

Models such as the Porter Value Chain derivatives were crafted and annunciated as part of the exclusive domain of Pre-2000 challenges faced by multi-national corporations. Their intrinsic design and their resource base were tailored to the MNC for strategy making in Pre-2000 PESTE macro environments. In Post-2000 the degree of complexity increased and involved the concepts of business ecosystem type models such as multi-sided Markets.

Internally within MNCs and SMEs a different set of skills exist in the context of executing the Pre-2000 and Post-2000 business models. Each possesses a different set of skills and mindsets on the values of epistemic convergence and the need for mobilizing such skills beyond the levels of their immediate competencies. Beyond the cognitive, experiential and relationship skills that are

required for sharing of knowledge within the organization, difficulties arise on the resources that are differentially available and deployed for internal staff training and development. MNC firms are more likely to possess a wider range of academic, technical, commercial, legal, and industrial management skills – both at the time of staff recruitment and after regular Human Resource Department organized training and team development programs.

The knowledge base of the typical SME by contrast is concentrated on the technical and production/ manufacturing challenges at hand. Also the internal knowledge base is more likely to be confirmed to a few individuals. The differentials in the internal knowledge bases between SMEs and MNCs do therefore create challenges for SMEs expected to utilize the 100-year - $1 trillion portfolio of business models and concepts that were originally developed exclusively for the advancement of MNCs.

3.3 The Problem with the Convergence and Mobilizing the External Knowledge Resources

The epistemic dissonance in their strategy-making potential extends beyond the differences in the internal knowledge-base between the MNC and the SME. Specifically their differences in their "external resource mobilization" capabilities are even more pronounced.

MNCs by their inherent nature have significant advantages from both the supply-side and demand-side dynamics of their potential to mobilize, converge and manage external resources for the MNC benefit.

On the supply-side for example, MNCs are regularly approached by intending partners, experts, specialists and management consultants. Each seek to offer specialist skills, innovations, products and services that could be incorporated into the MNC portfolio.

Similarly on the demand-side, the exposure and experiences in multiple locations, markets, cultures and entities provides MNCs with hard evidence on the types of joint activities required to satisfy these varied demands. As a result, MNC Human Resources programs actively focus on staff training on external relationship building, opportunities for contracts development (in the form of strategies alliances, in-corporated and un-incorporated joint venture, etc). More specifically MNC programs generally provide their staff with "culturization" programs and language skilling – all with the intention of building and aggregating coalitions of enterprises and integrated capabilities. By contrast – the SME firm is generally experience-poor in both the supply-side and demand-side by comparison with the MNC capability to recruit and leverage the external resource-base.

This differential dis-advantage is magnified in the context of the Post-2000 business era where the acknowledged fact is that no single organization can provide all of the global customers' fulfillment needs all of the time. The Post-2000 requirement for merging, mobilizing and integrating external resources is further evidenced by the mergers that are continually taking place in the Post-2000 IT and computer industry sectors. The Research Project therefore acknowledges this problem of using MNC-oriented business strategies that require this type of external positioning and relationship management skills.

3.4 The Problem with the Pathway for SME to EGI to MNC

The Research Project recognizes a further set of epistemic factors that prevent rapid and simplistic re-utilization of MNC-directed business models and concepts that have been accumulated in the 100-year - $1 trillion Information Tsunami.

The relative differential position between the SME and the MNC on the strategic Integration – Response (I-R) grid graphically illustrates the need for differential pathways and fulfillment – delivery strategies for the SME.

MNCs for example are much closer to the eGI (10, 10) coordinate on the IR-grid in comparison. The knowledge assets, resources, models, etc are all customized for the relatively shorter MNC pathway for achieving (10, 10) coordinate for eGID success.

SMEs intending to readily use, merge, converge and manage the MNC-knowledge base must therefore first attain an additional level of knowledge and resources to at least reach the same epistemic positioning being maintained by MNCs on the IR grid.

3.5 The Underlying Issues 1: Enterprise Learning Capability

SMEs are therefore confronted by a dilemma in their need for strategy making. In Chapter 2 we therefore reviewed the corpus of knowledge that could be made available to SMEs in four selected areas of knowledge availability – viz., in the disciplines of academia, industry, knowledge management and innovation management. The research quest was to identify a model or framework which could be used to develop a strategy making capacity with the objective of successful SME participating in the global economy. The Review has however failed to identify the existence of such a model.

As a result of the failure to identify a ready-to-use Model for SME-eGID participation, the Research challenge now transforms into one of developing an Enterprise – Leaving type framework for SME engagement. It is argued that a "Learning to Learn" meta-requirement is required for SMEs to not only "do things right but to also do the right things" for SME-eGID success.

Without this meta-strategic approach to Learning and Learning-to-learn, the SME position would increasingly deteriorate as confirmed by and as illustrated in the global knowledge gap dynamics.

3.6 The Underlying Issues 2: Epistemic Convergence of Strategic Knowledge Resourcecs and Pathway for SMEs

In a similar finding from the Literature Review, it can be argued that new skills and competencies need to be developed to achieve managed convergence of the epistemologies embedded within the spectrum of knowledge created by the 100 year - $1 trillion Information

Tsunami. The spectrum's challenge is the breath and diversity of issues that are addressed in the context of the MNC, for whom the spectrum was exclusively and progressively developed.

A further underlying issue confronting SME-eGID success is the lack of knowledge and understanding of how the different models and concepts in the spectrum are linked together. Unless this knowledge can be achieved SME difficulties will continue in merging, adapting, transforming and implementing the original MNC-created resource-base.

3.7 Research Question 1 for Underlying Issue 1 – Why pre-2000 Strategic Models do not Work

The unit of analysis of the Research Project therefore needs to advance to the level of obtaining a determination of whether an epistemic framework can be developed for the SME. For example, the question arises as to whether there are functional elements within the spectrum itself that can directly enable, re-frame, and manage the spectrum's other (Pre-2000) elements for the required convergence of epistemologies. Can these functional elements for example, catalyse the Pre-2000 and the Post-2000 building blocks contained in the MNC–centric knowledge spectrum. The epistemic framework being sought needs to be able to select from the MNC – knowledge spectrum with an expertise in epostemic catalysis, to cut and paste and/or mix and match deployable epistemic assets within the spectrum.

In the science of molecular and DNA-genomic biology, a similar challenge has been successfully managed by the Post-2000, DNA mapping of the Human Geome Project. The DNA molecule effectively delivers the "Datacentre" functions in each of the 100 trillion cells that make up the human life-form. Within the DNA "information – molecule's – spectrum" of 3.1 billion nucleaotides are distinct "Interous", "Exons" starter sequences, and end-of-gene sequences.

This portfolio of markers have been instrumental in better understanding the protein-building-sequences" within the DNA spectrum. Post-2000 systems Biology has actively used this marker system to select, mix, match, silence, shut-down or enhance the functioning of the protein-building information models. In a similar manner, the Research argues that SME strategy making requires an equivalent system for the epistemic mapping of the MNC-knowledge spectrum.

Research Question 1 therefore directly addresses the need for any potential solution to map the epistemic content of the 100-year - $1 Trillion Information Tsunami from a structured and scientifically based viewpoint.

3.8 Research Question 2 for Underlying Issue 1 – Is there a SME Learning Framework

An equally important issue presents the second Research Question on whether an epistemic capacity can be developed within the typical SME strategic mindset, so that the MNC – dominated spectrum can be mapped and utilized for SME – eGID objectives.

Again the Research Question can benefit from the lessons of the DNA-spectrum mapping. The SME-epistemic capacity question can be reframed in the context of whether SMEs will be able to utilize their resources to extract, mix, and match the distinct and disparate epistemic models and functional elements within the epistemically mapped MNC-knowledge spectrum.

3.9 Research Questions 3 for Underlying Issue 2 - Is there a New Knowledge Model as a Pathway for SME to EGI

The scientific findings of Posrt-2000 System Biology can provide a further metaphor on the third Research Question of whether an epistemic model can be developed that would be grounded upon the findings relating to:

(i) Research Question 1 – Epistemic mapping of the MNC-100 year - $1 Trillion knowledge spectrum, with its identifiers and markers that can assist with the objective of isolating and re-sing epistemic assets – within a re-framed and SME-eGID focused strategy making objective; and

(ii) Research Question 2 – on whether SMEs can develop an internal capacity at relative ease for an inbuilt system to be able to actually extract the epistemic elements.

Conditional upon their outcomes, the third Research Question focuses on whether the epistemic mapping and the extraction capabilities can be operationalized into a Model.

3.10 Research Questions 4 or Underlying Issue 2 How Can We Evaluate the Success of the Proposed New Knowledge Model

The fourth Research Question naturally seeks to test and determine if the epistemic-map centric approach and Model could be subjected to analysis from a well grounded set of criteria. The answer to Research Question 4 would confirm the value of the epistemic-mapping-based Model and its potential for SME to satisfy the objectives of creating innovative products and successfully participating in the Global eGID landscape.

3.11 Chapter summary

This Chapter advances to a definitive stage and milestone in the challenge to assist SMEs participate in the global economy. Commencing with the characterization of the emerging Global Industry sector (eGID), as outlined in Chapter 1. We re-defined the research challenge into the issue of determining whether SMEs could utilize the 100-year-$1Trillion–Information Tsunami, ie. the knowledge spectrum. Chapter 2's Literature Review also confirmed that the spectrum was created for the near-exclusive use of the Multi-National Corporation (MNC). We presented the case that SMEs would therefore be unable to readily re-use the knowledge spectrum. We identified the existence of structural barriers and epistemic factors that required learning in the form of a meta-strategy to transform the MNC resources.

In this Chapter, we have therefored focused on the knowledge, learning, and epistemic factors that need to be accessed, transformed and mobilized for SME-EGI participation, . In identifying the barriers and their underlying causes, we pointed out 3 major problems and identified it's 2 key underlying issues. As a result we then raised 4 Research Questions. All are based on the scope and challenge to epistemically decode the MNC-centric knowledge spectrum for SME re-use in the Post-2000 eGID context. It is in this context that the Research Project advances to Chapter 4 – which addresses the epistemic–decoding challenge in the context of the four Research Questions.

CHAPTER 4 EPISTEMIC CONTEXT OF RESEARCH QUESTIONS AND CONCEPTUAL SOLUTIONS

4.0 Introduction

Chapter 4 preseents as a conceptual solution, the appl;ication of the Blooms Taxonomy with integrated elements of the Pre-2000 and Post-2000 knowledge base, to function as a structured learning approach for the generation of SME-relevant strategy-making and their 4 research developed in Chapter 3.

Specifically the combinations of Blooms Taxonomy with the Boisot I-space, with its framing of an epistemic summit-position, and with the development of a Fitness Landscape for eGI strategy-making are based on the need to respond to the status of eGI as a Complex Adaptive System. The integrated Bloom-Boisot portfolio are also presented as an integrated approach for the removal of the inherent barriers preventing the MNC-centric (but eGID focused) knowledge assets from utilization as a "SME-relevant epistemic spectrum".

In the lead-up to Chapter 4, the emerging Global Industry Domain (eGID – in Chapter 1) and the Literature Review of the strategy-making knowledge assets (Chapter 2) together defined the research project's epistemic boundaries. In this context Chapter 3 identified their problems and their underlying issues and 4 research questions were crafted.

Chapter 4 seeks to address these challenges by the reframing of a knowledge-spectrum for re-use within an SME-eGID-centric context. This Chapter offers the Blooms Taxonomy as a transforming and learning methodology. Its integration with the Boisot I-space seeks to develop the required Epistemic Ascent Routines to manage the learning of the complex isssues of conmomittance, convergence, divergence, and dissonance among the knowledge assets of the Pre-2000 and Post-2000 eras. Finally Chapter 4's Learning Taxonomy seeks to utilize the lessons from Bio-mimicry so as to systematically address SME issues in eGID. It seeks to thereby achieve the required transformation of MNC-centric strategy-making building blocks for SME use in the specific context of the Research Questions.

4.1 Terms and Concepts used in this Chapter

Blooms Taxonomy – defined from the Learning framework in which a successive stage of learning transforms the knowledge-base from its original state of awareness to a competency to utilize the learned knowledge.
Knowledge spectrum is defined as the collection of business concepts, models, pathways, etc that can provide guidance for strategy-making once their knowledge assets are aligned in the discipline of a structured spectrum.

Epistemic Ascent Routines – is defined as the structured cognitive and staged learning processes through which SME-relevent strategy-making would need to take place in a progressive manner from the stage of basic awareness to strategy-making and innovation capture

Boisot I-space – is the framework introduced in Chapter 2 in which a structured 3 dimensional arrangement of knowledge elements can boost the potential for innovation capture and eGI success

Third Dimentsion of the Boisot I-space – is the collection of "Abstract" knowledge assets that make up the Z-axis of the Boisot I-space. The "Abstractions" are epistemic and cognitive "conditions of state" . Learning and access to the epistemic summit are achieved when the Third Dimensional knowledge are actively integrated with the knowledge elements in the X-axis (Delivery or Fylfillment knowledge elements) and the Y-axis (of Codified knowledge)

DNA - is Deoxy-ribo-Nucleic Acid is the bio-chemical molecule which functions as the resident master controller contained in the nucleus of every one of the 100 Trillion cells that make up the human life-form.

DNA as an Information Molecule – results from its structure with sequ3nced arrangments of its 4 constituting nucleotides Adenine, Guanine, Cytosine and Thymine (represented by A,G,C,T). The unique nano-scale patterns generated by the sequences of the nucleotides create, adapt, transform and deliver the required bio-molecular information required for the functioning of the human life-form

DNA and Genes – all proteins, (which are the building blocks required for human development and survival) are created through the "expression" of the information codes embedded within the genes-segment of the DNA molecule. While less than 20,000 protein-coding genes have been mapped, more than 2 million gene-expressed proteins are claimed to exist. The multiplying effect of more than 100 can only be explained by the interaction between the genes and the non-protein coding segment or the epigenes

DNA information molecule function – results from its dual-differential information molecule status. Its genes provide information for synthesizing proteins (a relatively well known scientific discipline) and it's "epigenes" which provide non-protein coding molecules (that control protein synthesis through a relatively unknown"epigenetic" domain)

DNA parallels with Strategy-making – results from its Protein-coding Genes being similar to well published Pre-2000 and Post-2000 business models and building blocks for strategy-making

DNA genes and epigenes as the Epistemic Metaphor – results from this Research project's argument that the the Protein Coding genes are similar to the published strategy-making building blocks, while the epigenetic controls are similar to the catalyzers and transformational agents that generate innovation from these generic building blocks

DNA- Genes and Epigene metaphor justification – is derived from the scientific discovery that less than 1.8% of the DNA modelcule is dedicated to its protein-coding genes. The 98% segment is involved in controls over the 1.8% bio-building blocks. This is mot dissimilar to the

strategy-making domain where there are a relatively small number of building blocks (genes metaphor) but with an exploding number of variations that make up EGI (similar to the effects of the Epigenetic controls imposed by the 98% DNA segment)

Epistemic metaphor is defined for the commonality that exists based on the use of learning and knowledge building blocks.

Convergence of epistemologies is defined the relationship building between conceptual entities based on shared use of common knowledge building – blocks. Convergence is best achieved when the Third Dimension of the Boisot I-space are integrated with the X-axis and Y-axis elements to achieve the Ascent Routines of the Bloom Taxonomy

Structural dissonance – is presented in the context that the epistemic spectrum of knowledge aggreagated over 100 years was primariloy developed for MNCs. The MNC related assumptions on target expecations, resource availability, time-frames, etc bear little relevance to SME enterprises and therein lies the structural dissonance that needs to be overcome if SMEs are to use the MNC-characterized building blocks for EGI strategy-making

DNA as an Information Management System- is the basis for the use of epistemic metaphor to assist SME-EGI relevant strategy-making. The DNA molecule contains 4 conditions of state for its data management just as Digital Systems contain their 2-bit Binary code of 0 and 1, as a the cut-down version of Nature's DNA information molecule

Bio-mimicry – is the basis for boosting the epistemic effectiveness of the Bloom-Boisot Conceptual Solution. Within the epistemic metaphor, the well published "genes" of the DNA molecule are compared with the Pre-2000 and Post-2000 knowledge elements existing in the public domain. The "non-protein-coding genes" or the epigenetic segment of the DNA molecule can be compared with the third element of the Boisot I-space and its role in achieving the required Epistemic Ascent Routines in conjunction with the Blooms Taxonomy of Learning

4.2 Knowledge Spectrum

4.2.1 MNC centric knowledge spectrum of strategy-making

The case is presented that the 100-year $1 Trilion Information Tsunami does possess commonalities and relationships within a unified structure of all knowledge. The separate Pre-2000 and Post-2000 strategy-making concepts, models, frameworks etc (as presented in the Literature Review) can indeed by integrated into a "strategy-making – building block – knowledge spectrum".

The origin of the strategy-making knowledge spectrum commences from the time of the classical Greek perspectives and it continues with almost daily reports from the industrial and business press. They report on innovations, new success stories, technological advances, and the emergence of new firms leveraging the internet and web technologies.

The case is presented that the knowledge spectrum is dynamic and growing. More importantly the spectrum results from and directly represents the outcomes of the individual members comprising the global/ eGID landscape.

While the Post-2000 knowledge spectrum does contain details of SME successes and contribution to eGID, the spectrum is predominantly MNC-centric. The content and the context of the spectrum relate to the manner in which MNCs are progressing in their quest to attain their global credentials and achieve the (10, 10) coordinate on the IR grid. The scope for convergence within the spectrum therefore exists to the extent that its strategy-making building blocks are commonly related to the MNC-centric types of goals, contexts, and target-pathways.

The progressions of the spectrum over time demonstrates a greater propensity for technological advancement and the creation of new Business Models – such as Business 2.0 type innovations.

4.2.2 SME – MNC dissonance on the knowledge spectrum

The issues posed by the Research Questions unfortunately are also subject to epistemic dissonance. The MNC-SME differences in the business related and commercial related realities are significant. The challenges in the Research Questions can therefore be reframed to question whether the knowledge spectrum can be utilized for SME-eGID purposes despite the SME-MNC dissonance and differential positioning in the global economy.

4.2.3 Dissonance Barriers in Internal, External and Positional epistemologies

More specifically, the problems of repositioning of the knowledge spectrum as the unit of analysis requires the dissonance to systematically address:

(i) Internal resource dissonance from differential competency levels among the 2 groups of staff employed by MNCs and SMEs

(ii) External resource dissonance on their differential capabilities to recruit, mobilize, and adapt and integrate elements of the knowledge spectrum, and

(iii) Positional dissonance on the differential launch positions and pathways from which SMEs and MNCs can achieve (10,10) eGID success.

From an epistemic viewpoint therefore the Research Questions directly relate to balancing and managing the convergence dissonance factors within the knowledge spectrum.

4.3. Epistemic Metaphor of Knowledge Spectrum

In its most simplistic form the convergence – dissonance within the Research Questions can relate to the question of whether the MNC's epistemic shoes are too large for the SME joining to eGID.

A more scientifically-based metaphor exists in the relationship between the epistemic elements that make-up the strategy-making knowledge spectrum and the protein-coding gene elements within the DNA-molecule-spectrum. From the time of the 1953 elucidation of DNA structure (and its sequencing of the 4 nucleotides in the Double Helix by Watson and Crick), the role of DNA molecule as an epistemic or knowledge spectrum is being increasingly confirmed. In fact in Post-2000 Systems Biology the "Information – spectrum" role of DNA has been fully operationalized. The resulting spectacular rise in innovations in the field of Regenerative medicine, nano-biotechnology, and therapeutics are just a fraction of the success resulting from the epistemic spectrum approach to the DNA-molecule.

4.3.1 Epistemic Chromosome metaphor within the spectrums

In this context the DNA – spectrum is now characterised in part by regions known as chromosomes which are in turn characterized by collections of protein-coding genes, or protein-coding building blocks. The 22,000 such protein coding genes are grouped within the 23 chromosomes – that relate to specific groups of human life form functions.

In the strategy-making knowledge spectrum a similar functional grouping has been presented in the Literature Review (Chapter 2). Strategy-making building blocks (equivalent of DNA genes) have been presented in 4 function groups (equivalent of DNA-chromosomes), as follows:

- Gene equivalents necessary for the construction of theoretical or conceptual building blocks for strategy making (largely contributed by Academia)

- Gene equivalents generated from the advances in technology (largely contributed by Post-2000 Industry)

- Gene equivalents of knowledge in its supervisor role of managing the application and synthesis of the building blocks, and

- Genes equivalents for building innovations in the form of new products, services, business models, ecosystem collaborations, etc.

The Research Questions can be progressively transformed from the subject of managing the knowledge spectrum in general to one of specifically managing the 4 chromosome equivalents that make up the knowledge spectrum.

4.3.2. Markers for managed convergence of epistemic metaphors of the Research Questions extends the focus to determine whether the epistemic markers, separators, growth factors, starters, terminators and integrators, etc of the different building blocks will be possible.

Findings from Post-2000 Systems Biology confirm the importance of these functional groups of DNA-building blocks. Post-2000 findings have further confirmed that these groups of building blocks are of vital importance to the management of the block-building genes. The building block structural genes are in fact controlled by their non-protein coding gene equivalents.
For the Research Question therefore and its knowledge spectrum unit of analysis the determining issue is whether a Model or a systematic – framework can be developed to epistemically manage both the structural building block (protein coding genes) as well as their controllers (non-protein coding elements).

The scientific basis of the Post-2000 DNA – Gene – Controller functions embedded within the DNA – biological spectrum also confirms that this Project's knowledge spectrum must similarly be assessed to determine if we can apply the Research Question to both their coding and non-coding entities that make up the equivalent of the 4 epistemic chromosomes – that embody the 100-year-$1 Trillion Information Tsunami's entities.

4.4 Research Question in context of DNA Metaphor

In this context it is argued that the parallel epistemologies embedded within the DNA – spectrum and the strategy-knowledge spectrum can provide a tangible perspective on the 4 Research Questions. The commonality of the genes, with the models/ strategy building blocks and their respective controller equivalents need to be contextualised in the context of Post-2000 scientific findings in the areas of molecular and cellular biology including proteomics, regulatory biology and stem cell developmental biology.

4.4.1 Metaphor based Knowledge Spectrum Mapping

The Post-2000 Human Geome Project for example mapped the genomic entities of the 3.1 billion DNA information containing A, G, T, C nucleotides.

The parallels with the strategy-making knowledge spectrum are significant. Both "mapping" perspective have been conducted to put in perspective 100 years of cumulative knowledge entities. In the DNA – spectrum, the work commenced approximately 100 years before the Human Genome Project map of the DNA – spectrum.

In the strategy-making parallel the first decade of the 21st century similarly marks 100 years of research and strategy by PwTaylor and Henry Ford. Essentially they too commenced the presentation and the aggregation of the building block concepts and constructs that have made the respective spectra.

To a certain extent the Research Question therefore requires a definctive finding that the metaphoric parallels can be of benefit to SME strategy – making for eGID success.

4.4.2 Metaphor Decoding

In a similar justification, lessons are offered by the Human Genome Project that was able to identify "controller" elements within the mapped DNA-epistemic spectrum. Genomic entities such as Interons, Exons, Transcription factors, and Transposons for example have been identified within the mapped DNA – Genomic spectrum.

These entities are increasingly being identified with specific temporal, developmental and integrative transactional functions of the epistemic values characterised by and embedded within their respective sequences. Stem cells for example are transformed through such controller functions. Their pluri-potent capacity to become mature single/ dedicated cells is achieved by the interactions provided from the non-coding / controller segment of the genomic DNA spectrum.

The Research Question therefore needs to be answered in the context of the "Decoding" of the knowledge spectrum to the same extent as the Post-2000 decodin that is being increasingly achieved after the initial mapping of the Human Geome.

4.4.3 Metaphor Models

The combination of the Mapping of the Human Geonomic spectrum and the identification of the controller segments within the spectrum are providing the innovation launch platform for Systems Biology. The Freeman Dyson pronouncement that the 21st century will be the century of Biology is being played out and reported upon with innovations in Regenerative medicine, artificial limbs, new therapies and drug regimes, and new scientific disciplines of bio-technology, tissue engineering and bio-medical engineering.

The transformed Research Question in Model building therefore focuses on the potential to create a new business model in the form of a meta-strategy – building capacity by the "mixing and matching" of the different elements within the coding and non-coding (controller) elements of the equivalent of the strategy-making knowledge genome. The genome – metaphor facilitation needs to similarly create innovations in business models, new products and new services for SME – eGId success.

4.4.4 Metaphor Model Testing

Again the experiences of Post-2000 Systems Biology and the innovations created in thinking, approaches and new products and services offer an epistemic surrogate on the fourth and final Research Question.

The determining factor is whether the models created by the epistemic "Mixing and Matching" could actually be subject to testing for validation and going advancement. The scientific proof

for the combinational potential in Post-2000 research is both significant and growing at an exponential rate. X-ray crystaligraphy, Cryogenic X-ray diffraction, ET-scans, PET scans, and Electro-enceplopathy studies are confirming the vast potential for Model development and validation that is created from the hypothesis of combinational genomics.

The unit of analysis for the Research project therefore specifically requires the use of "Testability" criteria that can then be applied to the knowledge spectrum. Specifically the new meta-strategy model (if one can be successfully developed) needs to be presented in a format suitable for epistemic analysis.

4.5 Overview of the Conceptual Solutions

If the metaphor – linked knowledge spectrum is to be successfully created, then its compositional elements (making up the integrated unit of analysis) need to be tested individually and collectively. The de-facto Unit of Analysis essentially becomes represented by the 4 "epistemic" chromosome groups of:

- Legacy characterised theoretical models and concepts;
- Technology enabled and generated building blocks;
- Knowledge generated entities and approaches, and
- Innovation focused framework and en-conditions.

Using the Bio-epistemic metaphor, the aggregate of strategy-making building blocks have been conceptualised as the four chromosomes forming the DNA – equivalent knowledge spectrum. Each of the knowledge chromosome equivalents maintain a different perspective for strategy-making, as follows:

(i) Theoretical knowledge elements largely managed by Academia;
(ii) Technology generated knowledge largely representing the accomplishment of the emerging Global Industry Domain (eGID);
(iii) Knowledge Management with its clinical like focus on isolating and re-using knowledge and
(iv) Innovation as per above.

The proposed conceptual framework is bio-inspired strategy-making building blocks of four chromosomes forming the DNA – equivalent knowledge spectrum to address the two underlying issues of Enterprise learning and convergence and mobilising knowledge through two proposed conceptual solutions, namely:

(1) the adoption of Bloom's knowledge learning principles; and

(2) Bio-inspired SME Strategy-making through convergence of epistemology, neurobiology and cognitive psychology

Therefore, the next 4 Chapters (Chapter 5-8), we devote to adoption of Bloom's knowledge learning principles to address theoretical knowledge elements; technology driven emerging

Global Industry Development (eGID); Knowledge Management with its clinical like focus on isolating and re-using knowledge and Innovation to address research question 1 and 2;

Chapter 9-11, we devote to convergence of epistemology, neurobiology and cognitive psychology as a new Bio-inspired knowledge model for SME business strategy-making to address research question 3;

Chapter 12-15 we carry out evaluation of the proposed bio-inspired SME strategy-making model from concept to real world case studies to address research question 4.

4.6 The Reason for Adoption of Bloom's Knowledge Learning Framework

Blooms Taxonomy offers a portfolio of cognitive and meta-cognitive approaches and resources for the development of a Conceptual Solution that can address the problems typically faced by SMEs. The epistemic rality is that SMEs are confronted by significant knowledge-translation and knowledge-transformational barriers. These must be overcome if SME goals to actively develop strategies for participating in Emerging Global Industry (EGI) opportunities are to succeed.

The need for learning and new knowledge arises from the dilemma that confronts SMEs with a spectrum of MNC-EGI type knowledge that is not in a "ready-to-use" format.
This is the epistemic feed-stock to which SMEs need to be made aware. In the series of epistemic steps that need to follow, SMEs would need to crate their own SME-EGI spectrum as the knowledge-base for their specific business ecosystem.

The reasons for selecting the Bloom Taxonomy as a conceptual solution are baed on:

(i) Epistemic Mapping – Stages and structures within Bloom's Taxonomy allow SMEs to map the parallels between the MNC-EGI spectrum and the intended SME-EGI spectrum and to develop an epistemic plan for inter-spectrum knowledge transfer

(ii) Epistemic Granuality – Once the epistemic gaps between the 2 EGI-spectra becomes evident, the existence of the different building blocks in which new learning is required will be well serviced by the structured approach offered by Bloom

(iii) Staged and Progressive learning – Once target ares for learning are identified from within the MNC-EGI spectrum, a logical and structured learning approach can be developed, using the 6 stages of the Taxonomy

(iv) Instructional Design – Group learning is a mandatory requirement for common advancement of business ecosystem membership and the Taxonomy facilitates rapid generation of consensus in establishing learning stages and the achievement of competency outcomes

(v) Trans-disciplined epistemologies – The Taxonomy offers a technology-neutral methodology that can be applied to the full range of EGI-domains

(vi) Cognitive and meta-cognitive focus – SMEs have generally started their businesses as entrepreneurs with a shapr propensity in applying cognitive and meta-cognition in their thinking. The 2 stages within the 6 categories of the Taxonomy, specifically address these domains in an almost fixed process requirement

(vii) Innovation in Strategy-making – The Taxonomy specifically facilitates structured approaches to innovation with a dedicated "Syntheis" stage preceded by Analysis and followed by Evaluations. This is the structured approach that will motivate SMEs to embed innovative thinking as a natural part of the strategy-making process

(viii) Ascent Routines – The Taxonomy's structure is well suited to assist SMEs develop strategy-making pathways among their ecosystem membership as a gradual ascent routine proces. In Complex Adaptive System terminology, the Ascent Routine potential of the Taxonomy is part of the necessary Fitness Landscape development process – a valid concept to manage the complexities of the EGI target sectors.

4.6.1 Adaptation of Bloom Taxonomy for Knowledge Learning

In the 1950 era of academic learning and development, the educational psychologist Benjamin Bloom presented a taxonomy to assist with learning. Figure 4.1 presents the stages that require consideration and successive advancement.

The determining value of the Bloom Taxonomy is the relevance it offers to assist in learning to utilize the knowledge spectrum. Bloom's taxonomy requires the segmentation of the epistemic states as per the following:

(i) Awareness of the resources required for learning and development;
(ii) Comprehension of the defining elements within the selected resources;
(iii) Application of the enhanced knowledge elements so that they can be aggregated into functional usage;
(iv) Analysis of the effectiveness of the applications so created by the aggregation of the knowledge element;
(v) Synthesis of different dispalate application constructs to form meta – applications with a systems – wide perspective;
(vi) Evaluation skills that can analyse and assess the entire portfolio of applications, meta-synthetic creations and the underlying fundamentals and building blocks.

4.5.2 Bloom Taxonomy for metaphor linked Knowledge Spectrum

It is argued that the Bloom Taxonomy should therefore be applied to the knowledge spectrum. Its epistemic elements need to subject to the Bloom Taxonomy criteria at the individual and collective perspective. Specifically each of the 4 epistemic chromosomes need to be evaluated on their potential to assist SME's with innovation and strategy-making for eGID success.

In this context, the succeeding chapters presented each of the epistemic chromosomes of knowledge in the spectrum. The Literature review (Chapter 2) has presented representational knowledge areas and their elements and related derivatives are made to be subject to the Bloom Taxonomy.

4.5.3 Bloom Taxonomy on Learning Barriers

In a direct connection with the Research Question and their underlying issues presented in Chapter 3, the Bloom Taxonomy is well suited to determine and evaluate the required management epistemologies for barriers removal to SME-eGID strategy-making success.

4.5.4 Bloom Taxonomy on eGID – SME Target Pathway

In a similar manner, the Bloom Taxonomy offers an assessment vehicle to determine if the knowledge – spectrum possesses an inherent capacity to offer SMEs a pathway for eGID connectivity.

In the next 4 Chapters, we will present great details about the epistemic response by transforming the Research Questions with a focus on the strategy-making knowledge spectrum. We also presented the knowledge spectrum with a meta-functional DNA-spectrum metaphor to assist in resolving the convergence – dissonance factors requiring resolution for the Research Questions.

Each of the next four chapters that follow, address the conceptual solutions of each of the four groups of knowledge building blocks (called epistemic chromosomes) and its alignment with the Bloom Taxonomy.

4.6 Conclusions

This Chapter commenced with the challenges posed by the 4 Research Questions that seek to authenticate the scholarship-value of this Research Project's attempt to transform for SME global business strategy-making the accumulated knowledge-base that is traditionally made of, by, and for MNC-centric strategy-making.

Based on the Literature Research of Chapter 2, this knowledge base is characterised by its 100-year old- $1 Trillion Information-Tsunami type legacy. Despite it comprehensive and expansive nature, it is the most relevant epistemic platform for use in the Post-2000 business era, albeit also with its MNC focus.

To overcome this barrier, Chapter 4 has offered a Conceptual Solution which offers learning protocols and epistemic ascent routines that make use of the intergrated Blooms Taxonomy of learning in conjunction with the Boisot I-space and the lessons from the DNA-information molecule (as a bio-epistemic metaphor).

Chapter 4 presented this collection of strategy–making entities with the Bloom-Boisot-DNA metaphor as part of the process required for any SME relevant strategy–making and for the required building of its knowledge spectrum. Reflecting on Chapter 2 and 3 the Research Project has identified epistemic parallels between the required SME-centric knowledge spectrum and the scientifically–evidenced "DNA–genomic spectrum". Both of the spectrums contain knowledge – representing entities for the management of on-going evolution and the need for innovation development.

More specifically scientific research on the DNA genomic Knowledge-spectrum has been presented as the epistemic source offering evidence-based lessons on how relevant segments within a seemingly standardized knowledge–spectrum could be made to interact with each other and how it can transform conventionally expected outcomes with the generation of innovation and emergence.

Based on its generative potential and the metaphoric relationship between the business-spectrum, the Chapter has argued for the transfer of its epistemic lessons to SMEs for the management of convergence, divergence, dissonance, emergence and innovation.

We are thus able to advance to Chapters 5,6,7 and 8 to determine whether the conceptual solution created in Chapter 4 can deliver a valid system to transform the MNC-centric–DNA-knowledge spectrum for the delivery of SME– eGID target objectives.

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CHAPTER 5 SME LEARNING AND THEORETICAL MODELS

5.0 Introduction

This is the first of the four chapters which seeks to develop conceptual approaches and potential solutions in response to the Project's Research Questions.

In this Chapter the focus of the Conceptual Solution developed in Chapter 4 is applied to the knowledge assets delivered from the domains of "Theoretical – Academia". Using the bio-epistemic metaphor , this Chapter focuses on the bio-epistemic equivalent of published knowledge asets that make up the metaphorical "Academia-genes pool". They are presented for t4sting to the Bloom-Boisot Taxonomy of Learning, as the determining criteria for fulfilment of the Project's 4 Research Questions.

The Chapter concludes with the acknowledgement that the knowledge assets from the Academia domain suffer from an epistemic deficit in the functional area of "Abstration of Knowledge". The same exercise and conclusions are reached when applying the criteria to the knowledge generating domains of Industry-technology, and the domains of Knowledge Management and Innovation Management (per Chapters 6. 7 and 8). Collectively the epistemic deficits are then addressed in Chapter 9 which seeks to present a bio-epistemic metaphor to overcome the barriers to SME strategy–making which is being forced to rely upon the 100-year MNC-centric knowledge-base.

5.1 Definition of terms and concepts used in this Chapter

Bloom's Taxonomy is defined as the stated approach to assist in learning – applied in this Project to strategy – making.

Knowledge spectrum – is defined as the aggregates of the knowledge elements for strategy – making that needs to be considered as a dynamic continuum for response to the Research Question.

DNA – Genomic – spectrum is defined as the epistemic metaphor that is used for managing the knowledge spectrum.

Epistemic Chromosomes – are defined as the aggregate of knowledge elements that have been categorised on their commonalities to assist with the Research Question.

Bio – epistemic metaphor – is defined as the theoretical construct specifically developed by the Research Project to catalyse the epistemic harvesting of those elements in knowledge spectrum best able to assist SME – eGID strategy-making.

5.2 Bloom Taxonomy

The Project's response to the Research Question requires an integrated assessment of 3 functional groups of epistemic factors:

(i) The aggregates of functional elements within the knowledge spectrum

(ii) The application of the metrics of the Bloom Taxonomy, and

(iii) The end-state reference to the demands and dynamics of the emerging Global Industry Domain (eGID).

Figure 5.1 illustrates the logical and epistemic relationships between these three groups of functional elements.

On the left of the diagram are the 4- epistemic "chromosomes" which together make up the knowledge spectrum to determine its relevance and usability for eGID – SME strategy-making.

The 6- elements of the Bloom Taxonomy are illustrated in the centre of the diagram. They stand between the knowledge spectrum (content) and the end-states of successful eGID strategies (illustrated on the far right of the diagram).

The Bloom Taxonomy is presented both as a criteria and a catalyst to determine if the epistemic mixing and matching of epistemic elements can achieve connectivity with eGID.

5.3 Blooms Taxonomy as the Metrics for Theoretical Oriented Business-strategy making

The 6 ascending stages of knowledge and learning within the Bloom Taxonomy represents the "Ascent Routine" of cognitive thought and cognitive behaviour. The aim is to map the Ascent Routine from the commencement state of knowledge awareness to the final levels of building capacities for high-order thinking and critical judgements.

It is argued that to advance SME competencies and capabilities from the basic awareness levels to high order/complex and critical thinking is to effectively provide SMEs with the epistemic pathway to eGID success. It is further argued that the Bloom Taxonomy is the proverbial epistemic "diamond in the rough". While it is actively used in schools' to assist with learning, it has not been popularized by the strategy-making curriculum in university business schools. Fortunately is legacy and popularity in the school-learning system have created a range of resources that can deployed for the SME-eGID Research Question learning challenges.

5.3.1 Problem analysis with the Bloom Taxonomy knowledge levels.

In this context, SME-eGID challenges can utilize the "Action Verbs" that associated with the 6 levels of knowledge.

(i) Awareness level – developing competency and capacity to define, describe, identify, outline, duplicate, match, or recognise or reproduce knowledge artifacts or elements from the knowledge chromosome equivalents

(ii) Comprehension level that would enable SMEs to classify, defend, justify, distinguish, explain, summarise and translate the epistemic elements within the epistemic chromosomes

(iii) Application level whereby the SME competency would allow the SME to change, choose, compute, demonstrate, interpret, manipulate, prepare, predicts, and produce strategy-making concepts from the epistemic feedstock within the spectrum

(iv) Analysis level by which the SME – strategy making would advance from a capacity to appraise, de-aggregate, categorise, characterise, conceptualise and differentiate the knowledge elements from multiple strategy-making perspectives

(v) Synthesis level of thinking whereby the SME would be in a capacity to combine, mix and match, create, re-organise, transform, and re-construct individual and group-modules of the strategy-making elements within the spectrum for the creation of more effective or innovative strategies, and

(vi) Evaluation level where in the learning and knowledge can attain the status of wisdom – the knowledge to manage the knowledge elements – at the "uber" level for decision making and implementation.

The evaluation level would enable SMEs to choose, compare, discriminate, and predict the scope for success before resource mobilization and deployment.

5.4 Awareness Problems preventing use of contributions from Academia

In this section we address the SME challenges in making use of the portion of the 100-year-$1 Trillion knowledge spectrum that has been developed through epistemic contributions from Academia.

Business Strategy-making studies from academia have been grounded in the earliest use of strategy-making, which has been the military sector and the lessons from the Ancient Greeks – Western Civilization's source of Strategy-making. Tsun Zu's "Art of War" lesson on the military use of strategy has been the dominant metaphor for strategy-making. Key limitation from an epistemic viewpoint is that the same military analogy is both the teacher and the user of strategy.

Ideas and cross fertilization of strategy-making has to a certain extent been lacking from an epistemic-sourcing viewpoint.

Also the eGID landscape offers additional issues beyond the teachings of Sun Tzu and his "The Art of War" treaties that address the 400-200 BC era. From the SME context the dominant military-metaphor has complicated the challenge of harvesting the 100-year knowledge base,

5.4.1 Epistemic Model for Problem Analysis with Academia contributions and Lessons

Figure 5.4 illustrates the model confronting SMEs who need to harvest the academic contributions made for MNCs to the global knowledge-base. The outcomes from Academia include the wealth of Strategy-making knowledge spectrum, Conforming Curriculum, Case, Study type Analysis, and Public Domain, information available in a wide range of text books. Residing in a more restricted mode is the hundreds of thousands of research articles in Journal and research study – reports on specialist knowledge in different domains.

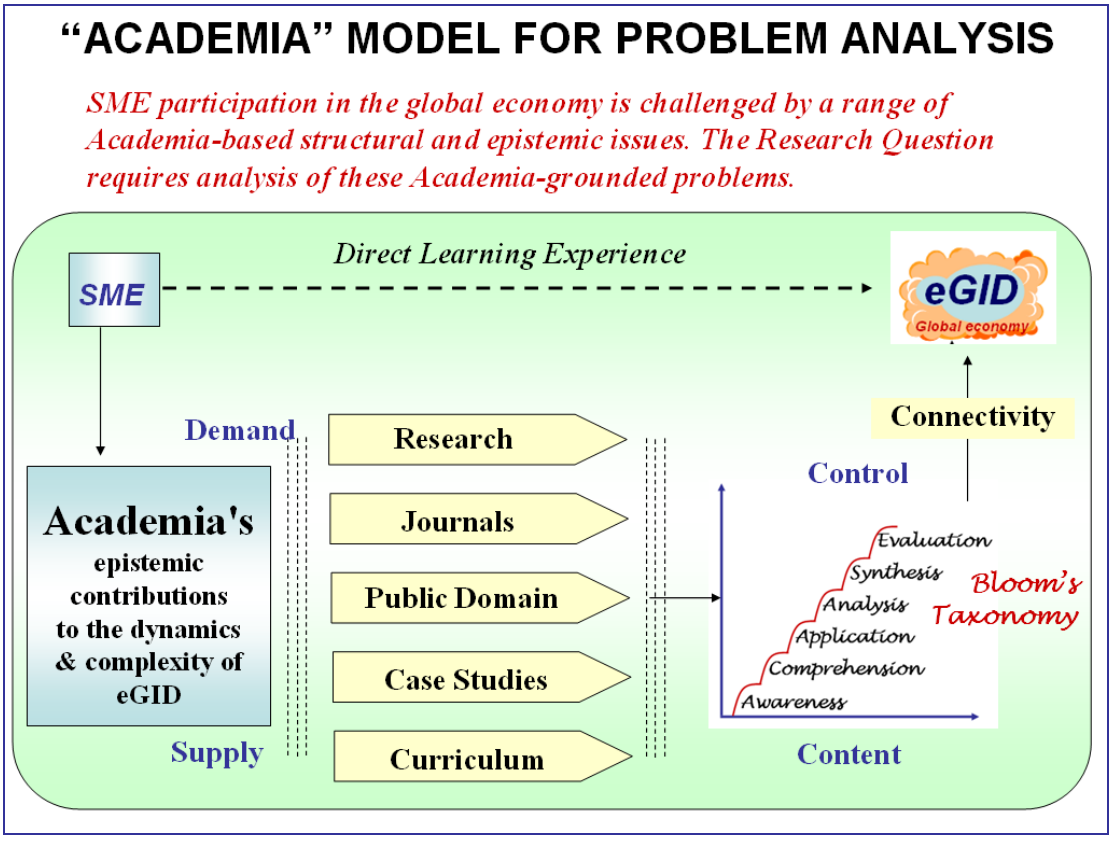

Figure 5.2 Specific methodology for using Academic – related resources

In Figure 5.2 we present the type of Analytical Model, and "Academic" context and their barriers challenging SME in the global economy. Barriers exist in utilizing the sub-sets of the academic content which in the earlier Literature Review have been shown to be responsible for the dynamics and complexity of the global economy.

5.4.2 Awareness Problems preventing use of contributions from Academia

5.4.2.1 Curriculum - The Porter Value Chain and its Supply Chain derivatives are the key elements within the functional landscape for cognitive development

In analyzing the difficulties for SME relevant strategy making, we have therefore selected the Porter Value Chain and its Supply Chain derivatives as the functional group of cognitive activities and actions against which the Bloom Taxonomy would be applied. Starting from the Porter Value Chain's Procurement activity, we test the knowledge and learning necessary for the activities of In-bound Logistics; Production, Manufacturing, Fabrication or Assembly; Out-bound Logistics; Sales and Marketing; After Sales Serrvice and Customer Relationship Management; and the advancement necessary for the other support activities of Technology Development, Human Resource Management, and General management and Corporate Infrastructure.

5.4.2.2 Public - Domain Internet Resources for Strategy-making that is available to SMEs

The SME challenge is finding the best approach to not only utilize the Porter Value Chain type elements but also to utilize the resources available on the Internet.

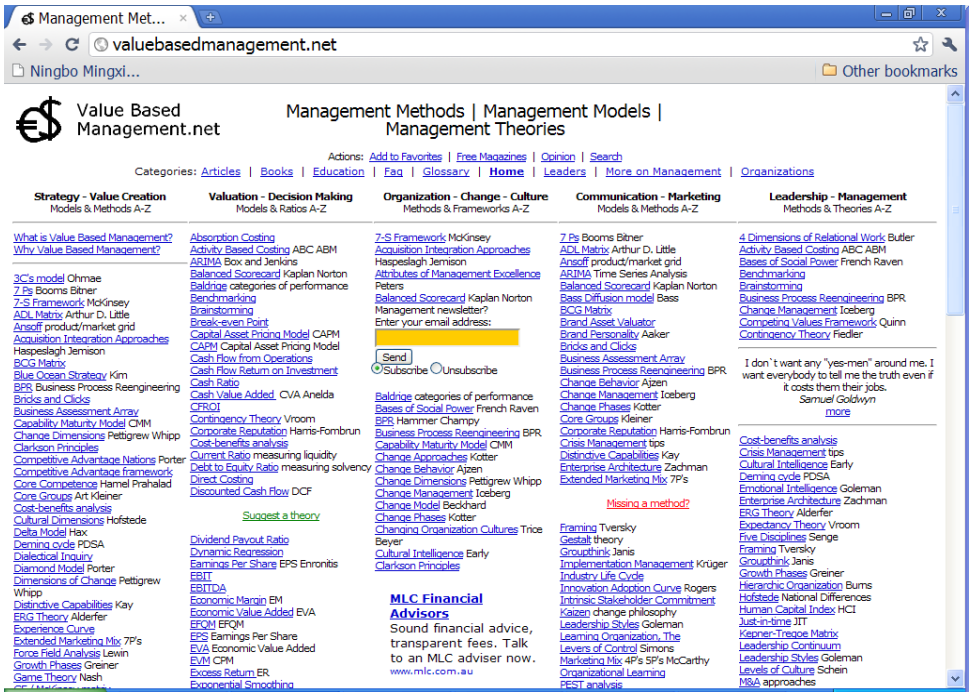

Figure 5.3 – Public domain information for strategy-making

Figure 5.3 for example illustrates the wide range of resources that are generally available from the web on strategy-making studies and the development of strategic models and concepts. The awareness challenge is magnified by the extensive range of strategy-making concepts that are outlined in this screen-shot of the web site at www.valuebasedmanagement.net. The web site specializes in providing summaries of the different strategy-making building blocks that are

freely available in their summary form. Each of the subjects covered in this web site briefly introduce the subject-model and then refer the visitor to books and reports or tutorials that can be purchased separately.

The extensive nature of the topics and their background knowledge can therefore be confusing to the SME who need to go beyond the awareness level and separate the epistemically important from the epistemically interesting. Also the key challenge is for SME strategy-making to move beyond the awareness level and to be able to utilize such resources with confidence and build-up on them to advance into developing solutions to satisfy Post-2000 demands.

5.4.2.3 Areas that need to be managed with an epistemic focus for innovation creation

Also academic concepts and the public domain versions of business models are replete with sub-concepts and terms that need to be mastered. Hidden from the published versions are their boundary limiting factors, roles and functional dynamics. SMEs are challenged by the demands of the epistemic considerations that are embedded within each of these constructs. These include business activities, technologies, and functional constructs of:

- Modules
- Bridges
- Cycles
- Chains
- Integrators
- Differentiators
- Platforms , and
- Validators –of these constructs

Business entities used as the basis for adaptations	***Epistemic Context for Strategy-making***
Modules	SME awareness needs to identify these modules and the functions being delivered. Several of these modules are embedded within "Black Boxes" and their functions at the nano-scale level can be difficult to identify. In eGID environments, the innovative products are extensively made up of these modules. However, they are seldom presented as such an epistemic accumulation.
Bridges	SME strategies need to address the demands for linking entities and concepts with other entities and concepts, so that the proverbial whole is greater than the sum of the parts
Cycles	SMEs need to create strategies that conform to the regularity that sometimes occurs in the process transforamtions or modifications that take place in the delivery of products or services

Chains	SMEs need to develop total solutions or a series of integrated product services that maintain a thematic function or end-condition of state as its defining characteristic for the delivery of cutomer value propositions
Integrators	SMEs need to integrate strategy-making building blocks from diverse and disparate sources and disciplines. The interfacing challenges are part of the need to create multi-functional products and services that utilize multiple technologies in single products. In other cases multiple products need to share a single technology.
Differentiators	With the choice of technologies, entities, and ecosystem membership and markets, SMEs need valid tools to differentiate and select the optimum pathways and levels of activites. Customer valuepropositions can be destroyed and investments wasted without proper real-time differentiation being applied to the strategic selections
Platforms	Business Growth Development Platforms are the key enabling resource that firms are currently creating and utilizing as the resource base from which a series of related innovations can be created. The platform provides the generic elements within the innovation that is topped-up with customized and innovation defining additions
Validators	SMEs need to overcome the Post-2000 Information and Data "Tsunami". The volume of available content overshadows and impedes the need to determine and check the validity of claims and counter-claims. Startegy-making is therefore confronted by this double-edged sword: a rich harvest of content, but the need for strategy-making tools that deliver valid choices.

5.4.3 Extensive scope for Non-students of Strategy-studies

Large sections of SMEs have advanced themselves from a practical background and by the sheer strength and brilliance of their founders. Over a 10-15 year period, SMEs are generally able to build confidence in the knowledge that they are indeed servicing a specific business niche and that the niche can be the platform for further expansion. Unless the SME is in a relative position of affluence, it can be assumed that SMEs generally lack a group of employees who have been students of strategy in under-graduate or post-graduate studies. Also the reality is that SMEs generally are not the first pick of students moving into industry, and who have high career expectations of working with Multi-National Corporations.

The net result is that the SME can be confronted with an epistemic landscape that can be daunting in the scale and scope of epistemic issues that may or may not be visile or suited for interconnection. Without a formal strategy – integration platform, such connectivity can be difficult for SMEs to realize the value in expending their valuable time in trying to make sense of the curriculum landscape and the linkage to existing SME operations.

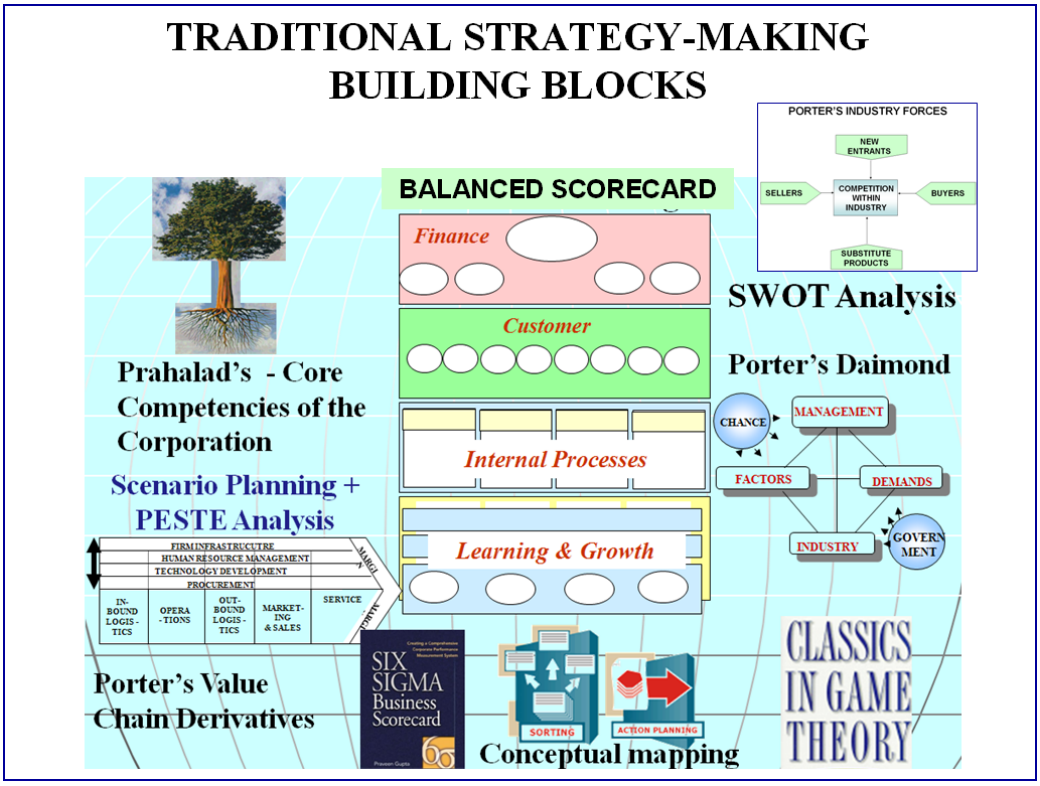

Figure 5.4 – Balanced Score Card and strategy map epistemic landscape

For example in Figure 5.4 we illustrate some of the strategy-making landscape of epistemic building blocks in which SMEs would need to achieve an awareness level of knowledge before they can learn to create strategies. They include as illustrated the topics of

a) Core competency management
b) The SWOT Analysis
c) Porter's Value Chain
d) Supply Chain Derivatives
e) Scenario Planning Analysis
f) Balanced Score Card and Strategy Maps

5.4.4 Deceptive simplicity for Non-students of Strategy-studies:

SMEs who are not students of business are generally unaware of the epistemic linkage between these issues and the dynamics of eGID operations. Also SMEs who are not students have no opportunity to realize the powerful potential of some of the strategy building blocks to be

customized into and SME context despite its relative simplicity. The Porter Value Chain in Figure 5.5 and its derivatives is one such example.

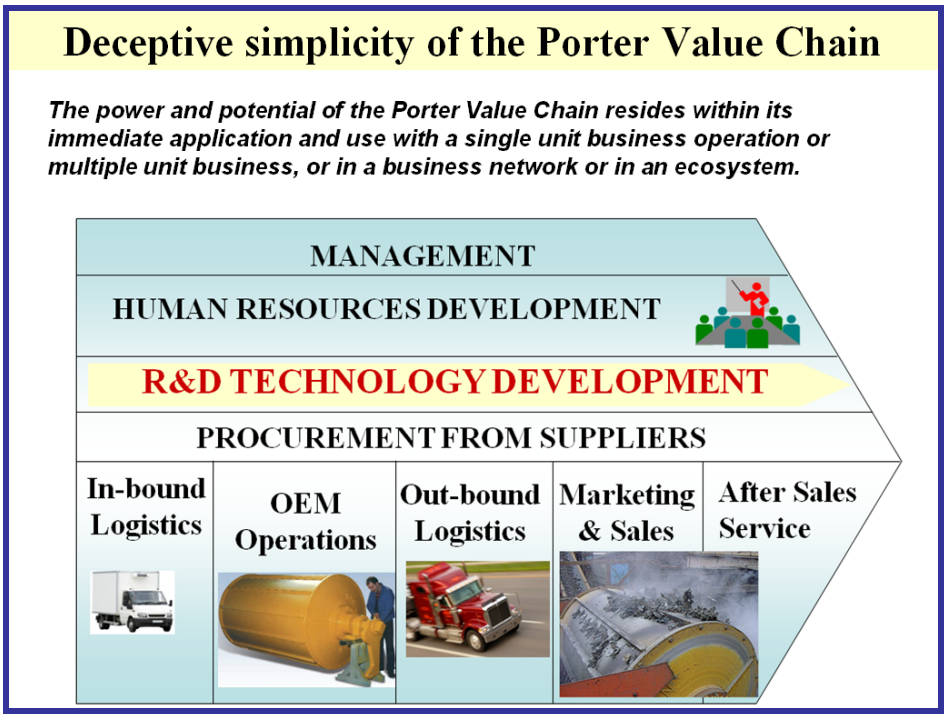

Figure 5.5 – Customization challenges of the Porter Value Chain

Figure 5.5 for example in the classical Porter Value Chain with its 5 core activities and the 4 support activities might appear to be relatively simple. Without being a student, the SME is unlikely to be aware that the elegance of the 9 activity-segmentation can be strategically used for a wide range of perspectives such as:-

1) Planning competency development and learning, so that the business can develop "full chain" specializations that contain the highest level of competencies required for a project, such as maintaining the "cold-chain" of a business service.
2) Benchmarking that can be carried out in each of the 9 activities with their respective industry counterparts, so that comparisons can be made to determine the scope for improvement and the need for strategic development within the industry sector.
3) Applying Activity-Based Costing approaches to the different groups or divisions within the Porter Value Chain.

5.5 Comprehension – Learning problems with Academia contributions

The "Comprehension" challenge for SME – strategy making is illustrated by the difficulties that SMEs could experience in the use of the Porter 5-forces micro-economic related concept, and the Porter – Diamond (the macro-economic concept).

In Figure 5.5 for example a fair degree of comprehension is required within the sub-domains of "Buyer-forces", seller-forces and intra – industry competition. The 5-forces brilliance of the concept lies deep within its simplicity and its hosting of a number of abstracted sub-issues.

Detailed level awareness and comprehension are required for example of the "substitute" products and new entrants. SMEs generally lack the level of resources obtainable from Market Research programs (that are the general support system used by MNCs to advance within and beyond the comprehension stage).

SMEs' comprehension of "new entrants" and their portfolio of customer value propositions are confronted by the same Market Research barriers.

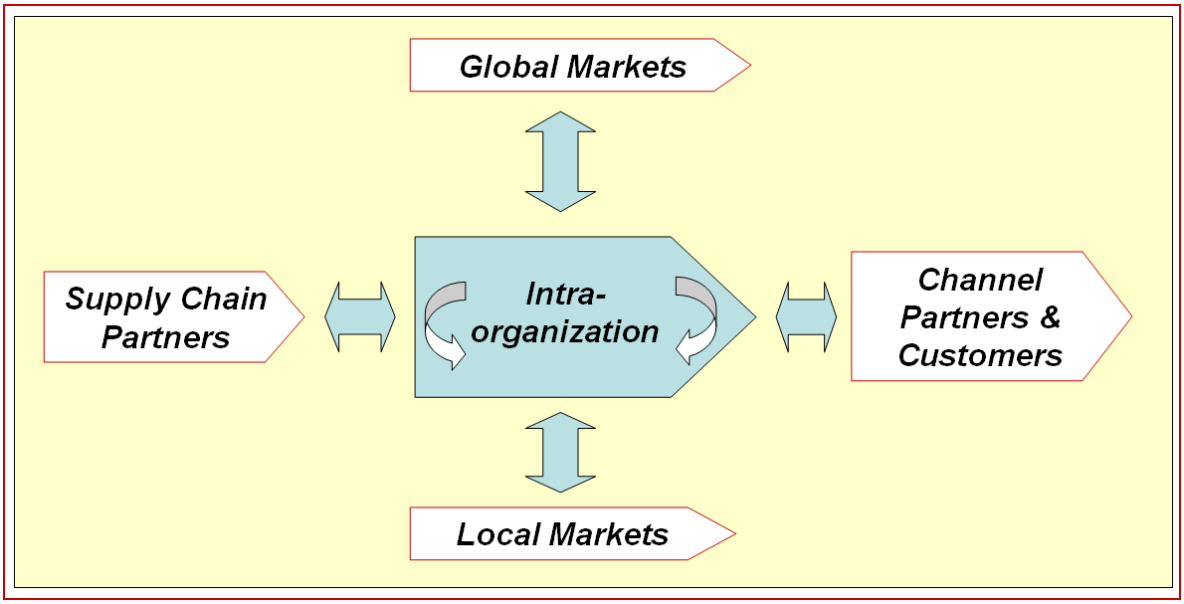

Figure 5.6 – Comprehending the 5 Industry Forces of Porter

5.5.1 Visualizing and comprehending the Business Landscape and the Customization Problems – the lesson from Chemical Engineering curriculum

The systematic approaches used by academia for example could benefit from the field of Chemical Engineering and their use of active ingredients to catalyze and customize the 100-year knowledge-base.

In Figure 5.7 we illustrate the varied nature in the functions and operations of the typical global business ecosystem and the varied perspectives from which the 100-year knowledge-base is likely to be approached for customization. Also each of the potential SME positions would operate from different levels of knowledge, with different types of immediate clients before the eventual client of the customer and or the Original Equipment Manufacturer.

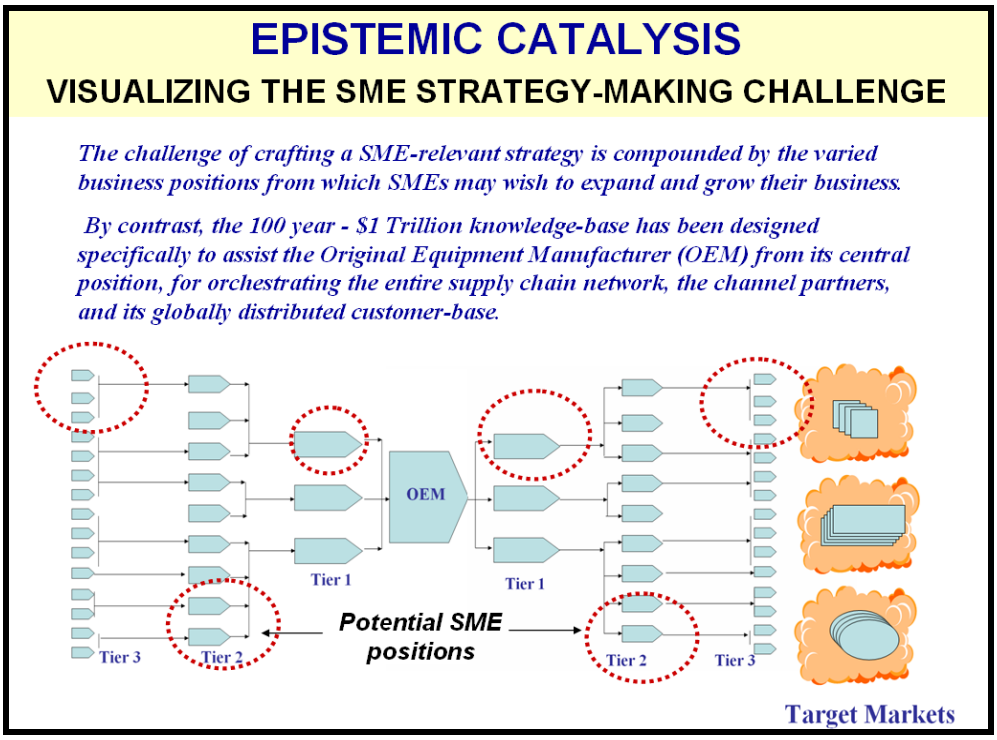

Figure 5.7 – Lack of knowledge to visualize and customize SME engagement in ecosystem.

From a comprehension viewpoint Figure 5.7 illustrates the difficulties that confront SMEs wishing to utilize the MNC-created knowledge-base as an immediate source for strategy-making. The typical supply chain network is shown in the diagram, with the Multi-National Corporation or MNC generally occupying the central position of Original Equipment Manufacturer or OEM. SMEs are generally to be found in one of the ancillary positions as a Tier 1, 2 or 3 supplier or channel partner, or just as a retailer of the goods supplied by the OEM. The challenge to utilize the MNC created database compounds the epistemic challenge of creating SME relevant strategies for business development and growth outside of their traditional positions.

Most SMEs do however possess an inclining of the overall business landscape and the generic activities requiring epistemic catalysis and customization. To provide an indication of the scale of the SME comprehension challenge, Table 5.1 uses an "active verb" format of these generic activities. At the risk of appearing to embarrass or underestimate the knowledge of the SME, it is generally unlikely that traditional academic intervention or industry training programs would go down to this atomic level comprehensive learning of business processes. And yet these business process units need to be learned across the extended Value Chain and its Supply Chain Management derivatives. A similar type of learning is generally a part of the curriculum of Chemical Engineering, under the term of Unit Operations subject to the key concepts to the changed inputs of different active ingredients.

5.5.2 Comprehending the impact of micro-scale Epistemic Elements

Each of the sub-systems within the Porter Value Chain and its derivatives (for example) need to be paraphrased, to estimate, predict and translate their sub-functions. Comprehension level skills

also require a portfolio of their assumptions, conditional status, and temporal nature and their dynamic intermediate stages and pathways.

EPISTEMIC ELEMENTS & CONTROLS	ACADEMIA	INDUSTRY	KNOWLEDGE MANAGEMENT	INNOVATION MANAGEMENT
Accommodate	√			
Activate	√			
Aggregate	√			
Annunciate	√	√	√	√
Captivate			√	
Collaborate		√		
Communicate	√			
Congregate	√	√		
Conjugate				
Consolidate	√	√	√	√
Celebrate				
Delineate				
Differentiate	√	√		
Duplicate				
Elaborate	√	√	√	√
Elucidate				
Enumerate	√	√		√
Eradicate	√	√		
Fabricate	√			√
Formulate				
Generate		√		√
Indicate	√	√	√	
Initiate		√		√
Innovate		√		√
Integrate				
Isolate	√	√	√	√
Motivate				
Obliterate		√		

Operate		√	√	√
Regulate		√	√	√
Replicate	√	√		√
Substantiate	√	√		
Validate		√		√

In general terms therefore, it can be seen that the Bloom Taxonomy based challenge is in effect a 3-dimensional learning problem. SME's need to manage this 3-D cube if they can take advantage of $1 Trillion that has been invested largely for strategy-making by Multi-national Corporations.

The 3-dimensional learning challenge forms the basis of the detailed considerations that apply to the 100-year-$1 Trillion Knowledge base.

5.6 Application– Learning problems with Academia contributions

Again the "non-student" SME is unlikely to achieve detailed knowledge levels of applying the learned comprehension for strategy – making in the global eGID landscape.

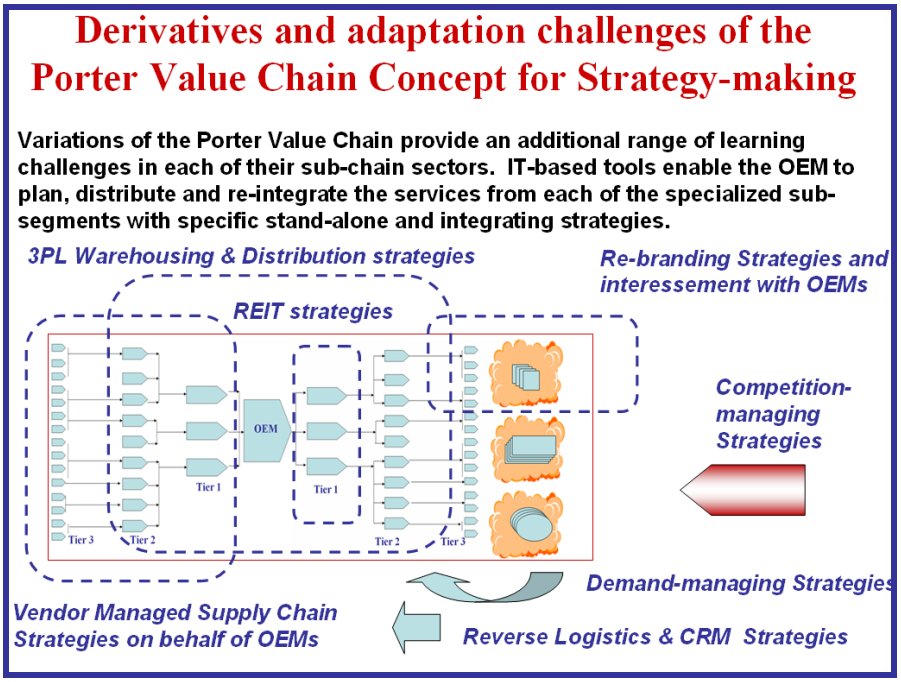

Figure 5.8 – Applying the Value Chain in multiple variations and modes of business

Taking for example the derivatives of the Porter Value Chain – Supply Chain Management System, it would be difficult for the non-student SME to differentiate between the following:

a) Demand-driven Supply Chains
b) Agile Supply Chain Management
c) Vendor managed Supply Chains, and
d) Learn Supply Chains

Each of these strategies approaches share several common modalities, however each also has its specialized industry sector in which it is the most appropriate. Without the assistance or academic case studies, the non-student SME could well assume they are all one and the same strategy and the "Application" outcomes could be jeopardized.

5.7 Analysis– Learning problems with Academia contributions

Figure 5.8 also highlights the classical problem on "Analysis" of the academic knowledge base for strategy making.

Visibility of Supply Chain Networks

SMES wishing to develop and manage total supply chains on behalf of themselves or a multinational can expect to face significant barriers in this most important of function of analysis of their needs and strategic requirements. SME would generally be unable to obtain the required visibility that customers and clients demand in the analysis and construction of innovative strategy-models. The main problem is that the SME does not have the economic power or the strategic resolve to determine and analyse whether all members participating in the network or in the business ecosystem as reported are making the optimal transactions and resources contributions.

5.8 Synthesis– Learning problems with Academia contributions

The success of "synthesis" focused strategy-making is underpinned by the earlier Bloom Taxonomy stages. Unfortunately the simplicity of the "synthesis" mechanisms illustrated in Figure 5.9 masks the detailed level of learning required for SME strategy making.

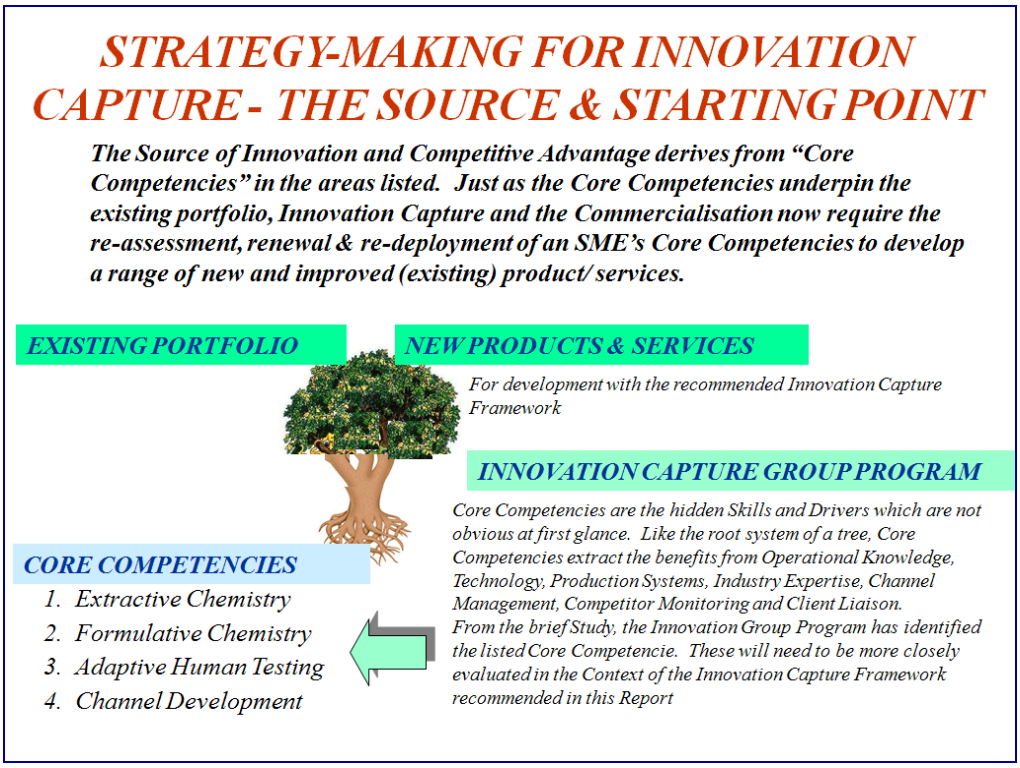

Figure 5.9 – The strategy synthesis framework

For example the SMEs need detailed knowledge before the acclaimed synthesis strategy making concepts of Prahalad and Doz can be achieved therefore through:

a) Core competencies – Internal
b) Core Capabilities – External
c) Co Configuration – Joint collaboration
d) Co-creation – Joint development

Figure 5.10 for example uses the metaphor of "symbiosis", as the required in biological systems for the survival of organism within an ecosystem. The membership needs to share the feed-stock, and or its intermediates before the final value producing outcome can be synthesized. The need for mutual support, the concept of the common good, and the need for sacrifice by some members for long term benefit are the foundational knowledge elements for ecosystem success.

It can be argued that SME's could be challenged by these requirements because of their non-guarantied nature and the need for them to be delivered well before benefits accrue. In the context of Figure 5.10, SME "synthesis" capabilities and knowledge are more likely to suffer from the re-direction or the focus of their efforts on the options of "presentation" or "absorption".

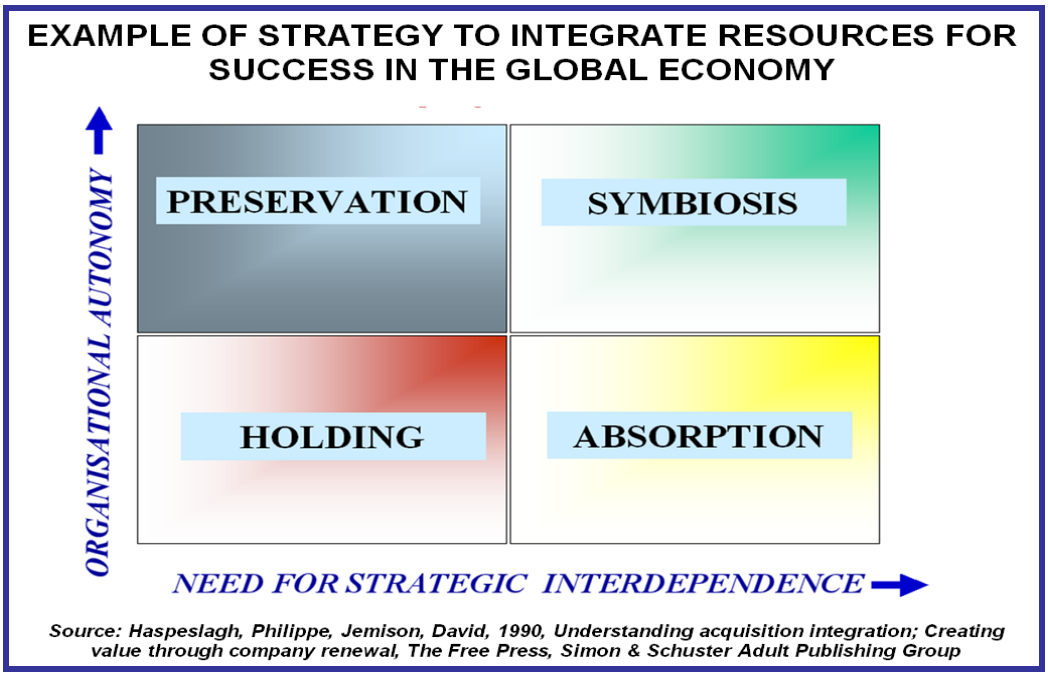

Figure 5.10 – The optimum epistemic position for synthesis

5.9 Evaluation – Learning problems with Academia contributions

It can also be argued that these issues of competing SME interest create "Evaluation Learning" barriers. SME decision making is challenged by the choice of moving away from well experienced positions to more lucrative choices that are less tangible and less easily evaluated. For example in Figure 5.11, SMEs could be forced to make choices on remaining as a part of the Value Chain being developed or managed by remote OEMs. By contrast the SME may have the option to seemingly organize the total business operations. Evaluation type strategic knowledge is required because the success factors extend beyond the mechanisms of the supply chain organization.
Rather as indicated in Figure 5.11, a 3-dimensional type evaluation is necessary. The Value Chain as indicated needs to navigate with strategies to manage the dynamic changes imposed by macro-economic PESTE forces, micro-economic industrial forces, as well as the entrepreneurial forces of the Mind.

Decision-making under the uncertainty of unresearched details would present SMEs with levels of risk that could far exceed their capacity to survive. In Figure 5.12 for example, the concept of "Strategic Intent" that is cited as a mandatory requirement may suffer from the proverbial "chicken or egg first" dilemma. Evaluation skills are necessary for the Strategic Intent to charter the 3-D navigation of the Supply Chain. And yet the increasingly knowledge – gap between SME supply potential and eGID demand levels prevent a proper decision being able to be made on the Strategic – Intent controlled navigation.

From these examples it can be argued that the evaluation – type barriers suffer from a structural deficiency to compare, contrast, predict and select the driving forces from the strategic content or outcomes from decision making.

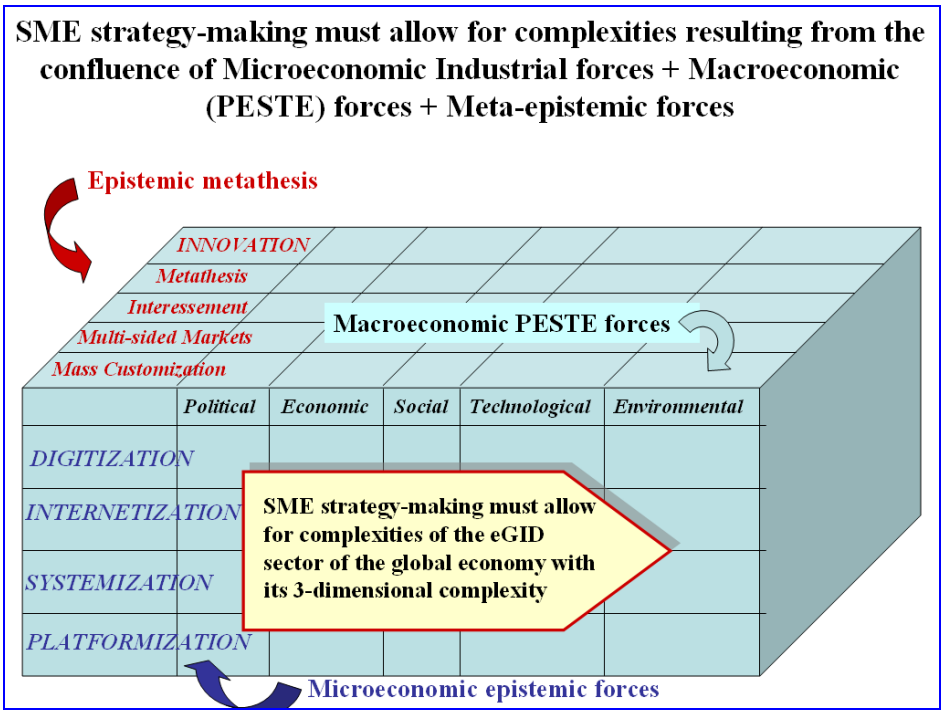

Figure 5.11 – Evaluating the PESTE impact on Value Chain Strategies

Figure 5.12 illustrates the case of the typical challenges that confront SME strategy-making. It is that the ground-breaking ideas and seminal-models from academic research are rarely applied on their own, in an isolated mode.

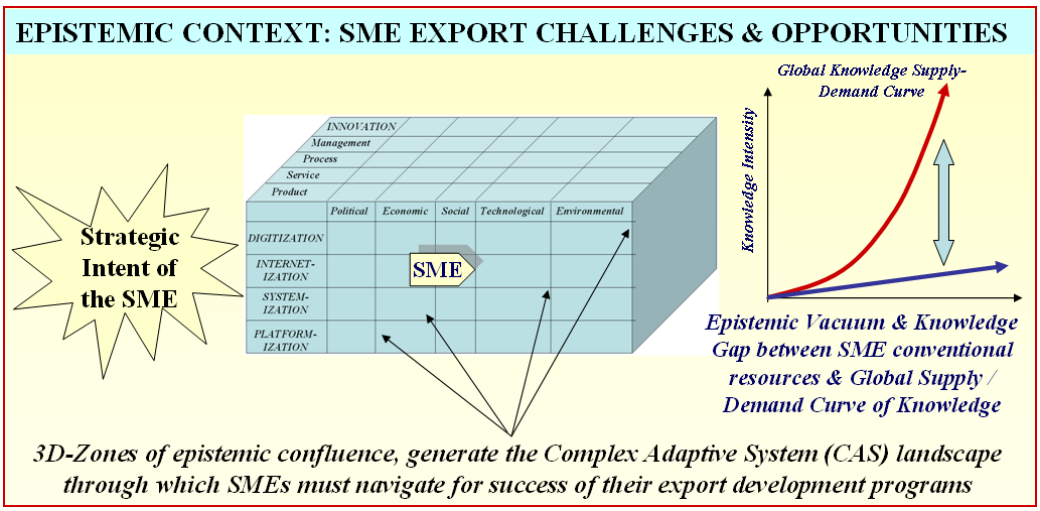

Figure 5.12 – Strategic Intent with a knowledge gap focus

Figure 5.12 for example is a combination of 5 or more streatgy-making concepts. In the extreme left is the concept of "Startegic Intent". Developed by Prahalad and Hamel, this concept is the vavigational reference point and motivator for business development and gwoth in profitability. The Statetegic Intent needs to be shared continually to match the PESTE macro-economic forces that are illustrated in the column headings of the middle item in the diagram. On the extreme

right is the ever important strategic need to maintain a dynamic link with the needs of the emerging markets, without being left too far behind.

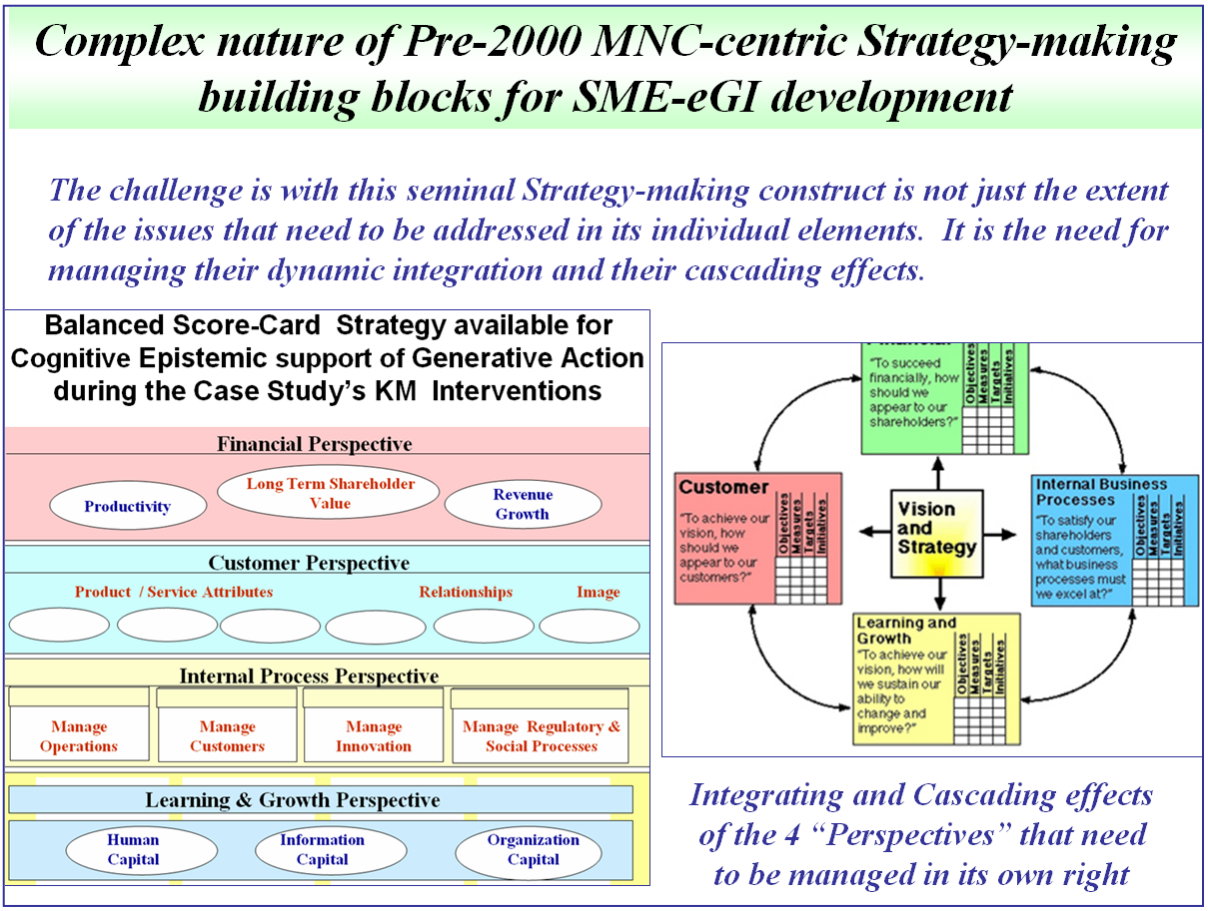

Figure 5.14 – Just-in-time knowledge with Balanced Score Card

The Balanced Score-Card of Professors Kaplan and Norton (1996) is a further multiple-entity strategy-making concept tha imposes demands on SMEs that can sometimes exceed the economic and epistemic capacities of SMEs to manage.

On the left of the diagram are the sub-entities of the 4 pespectives of Finance, Customers, Processes and Learning. A thorough understanding is needed in each of these areas because as illustrated on the right, they interact and impose limiations and challenges on each other.

5.10 Summary – Learning problems with Academia contributions

The new units of strategic-analysis extend beyond the "public domain" structural models if they are to respond to the and Complexity enhanced business ecosystems within eGI in a time – sensitive manner. Startegy-making deficits exist in applying the Bloom-taxonomy Ascent Routines to the MNC-centric public domain business models as further detailed.

Need for Knowledge – "Just-in-Time" not "Just-in-Case" :

We now live in an information economy that demands educational skills, and transformational knowledge with a time-sensitive competency because the half-life of knowledge is getting shorter. The product life-cyle of a "smart phone" for example is 18 months or less before it is

replaced by an even more powerful model. This means that strategy-making demand will increasingly be for "just in time" rather than "just in case" knowledge. The innovative transformation of public-domain knowledge for its new showing - anytime, anyplace, and any distance is now a competitive reality.

This "Just-in-time" demand on SME knowledge for strategy-making adds a further level of complexity. For example in the context of the Balance Scorecard concept (of Figure 5.123) imposes new barriers despite SME's being able to gain a relatively good understanding of its 4-perspectives, viz:

(i) Strategies that seek financial perspective outcomes on asset utilization rates, returns on investment, profit as a percentage of input variables, stock-turn over times, and EBIT type financial ratios, etc

(ii) Strategies based on delivery target customer perspective outcomes to deliver competitive and sustainable customer value proposition,

(iii) Strategies that leverage the business and technological processes and fulfilment with productivity, sustainability and visibility, and

(iv) Staff learning and growth perspectives which underpin all the 3 other perspectives.

For SMEs therefore the full gamit of strategic considerations need to be made and the necessary learning to be achieved in real-time, with immediate effect on an "as-needed continuum". The lack of SME resources to be respond symbolizes the Bloom Taxonomy – framed challenge that prevents SMEs from making potential legacy –based feedstock of the knowledge spectrum from Academia.

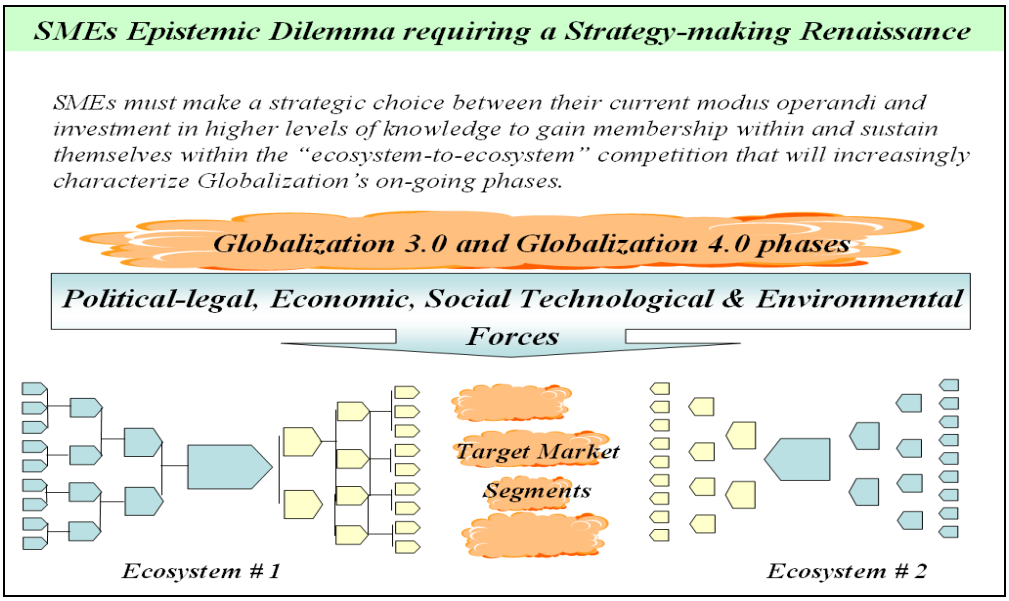

Figure 5.14 – The meta-challenge with the business ecosystem perspective

Figure 5.15 further illustrates the time – sensitive nature of the epistemic and business demands for strategy-making in the context of business ecosystems. Global competition has been progressively transformed from the initial stages of just being a competition of products - their functions, availability, price, user-derived benefits. Progressively the unit of competition has moved to include the dynamics of the offerings from firms and their time – sensitive agility with brand names, the countries of location and cultural association with quality, responsibility, and value maximizing systems. In the current business landscape, the unit of competition now transcends products, firms and nations – it is the time-sensitive and agile business ecosystem. Transcontinental membership and participation in the product's development is involved with almost 24/7/365 every product and service.

The time – sensitive demand further complicates the strategic viewpoint which is now the unit of competition between ecosystems. In the automotive industry for example, it is the competitive speed between Toyota and its supply chain network ecosystem and the parallel group of General Motors or of Ford or Honda. Ecosystems are now pitted against ecosystems, and the space for strategic SME involvement is contracting.

5.11 Conclusion

This chapter has assessed the existence of epistemic barriers to SME strategy-making. It involves a double-natured challenge in the context of SMEs trying toutilize MNC-centric "academia-contributed" domain or portion of epistemic resources that have been accumulated over the past 100 years at an estimated cost of $1 Trillion dollars.

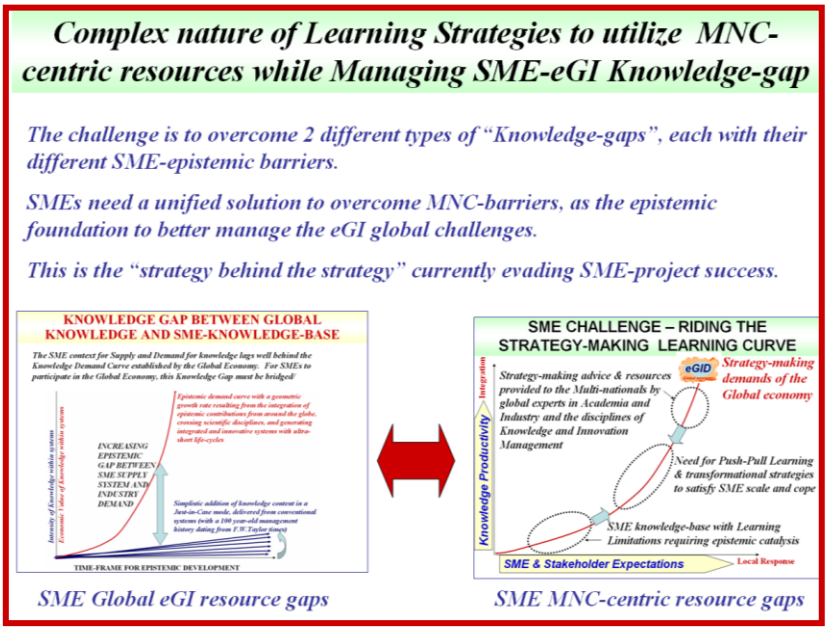

Figure 5.16 The double-nature of Learning problems with MNC resource utilization

This portion includes contributions made by learning and training organisations – all eventually gravitating into the public domain. They predominantly involve foundational concepts and theoretical models for strategy-making that are of immediate relevance to MNCs only (right of the illustration in Figure 5.16). Problems occure in their transference to the SME context from

their native MNC-public domain context. Further challenges thereafter exist in relating the transferred resources ot the emerging global industry sector (left of Figure 5.16)

Both challenges can be metaphorically linked as being the same faced by Pre-2000 Gene-centric Human Biology. Usability problems exist with limitations imposed within the publically known Protein-coding "genes" of the DNA–knowledge spectrum. In conformance with the scientific approach, sub-elements within the "genes" are similar to the generic type business entities, processes, and catalytic systems that have been outlined and reviewed in Chapter 2.

The conclusion has been reached that while the generic versions can be mastered, the Bloom Taxonomy of Learning is not fully capable of generating the type of dynamic innovations required for the creation of new business entities, industries and products for success with eGI.

In this Chapter we are advancing to the conclusion that the Bloom Taxonomy is a necessary but insufficient condition. Residual knowledge gaps for dynamic innovation for eGI business opportunities will need to be complemented with the use of the Boisot I-space and the a greater reliance on the bio-epistemic exemplar and the epigenetic segment of the DNA-molecule in particular.

It is in this context that we advance to Chapter 6 – where the focus is on the application of an integrated Bloom-Boisot-Bioexemplar-epigenetic approach, that will be applied to the knowledge assets offered by industry and technology enabled business resources. The same approach is applied to Chapters 7 and 8 where the focus is on resource contributions from the domains of Knowledge management and Innovation Manageement.

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CHAPTER 6 BLOOM BASED SME LEARNING WITH TECHNOLOGY ENABLED BUSINESS

6.0 Introduction

This is the second of the four Chapters that are dedicated to determine if the four segments of the DNA – metaphor knowledge spectrum can be utilized by SMEs to become engaged with the eGID opportunities.

In this Chapter the focus is on the Technology spectrum and determining the scale of the barriers that need to be removed if the Research Question of developing a universal Model that is relevant to the SME – eGID context can be achieved.

The Chapter on the Technology spectrum concludes with the assessment that it is mandatory for SMEs to make full use of the Technology portion of the knowledge spectrum.

The Research Project however argues that a full range of "catalytic factors are required for the transformation of SME – bricks and motar" type operations to the virtual world of IT and global connectivity.

The search for the missing catalytic factors then continues in Chapter 7 to determine if the Knowledge Management construct can assist with the development of Technology – generated strategies.
This is the first of the four chapters which seeks to develop conceptual approaches and potential solutions in response to the Project's Research Questions.

In this Chapter the focus of the Conceptual Solution developed in Chapter 4 is applied to the knowledge assets delivered from the domains of "Theoretical – Academia". Using the bio-epistemic metaphor , this Chapter focuses on the bio-epistemic equivalent of published knowledge asets that make up the metaphorical "Academia-genes pool". They are presented for t4sting to the Bloom-Boisot Taxonomy of Learning, as the determining criteria for fulfilment of the Project's 4 Research Questions.

The Chapter concludes with the acknowledgement that the knowledge assets from the Academia domain suffer from an epistemic deficit in the functional area of "Abstration of Knowledge". The same exercise and conclusions are reached when applying the criteria to the knowledge generating domains of Industry-technology, and the domains of Knowledge Management and Innovation Management (per Chapters 6. 7 and 8). Collectively the epistemic deficits are then addressed in Chapter 9 which seeks to present a bio-epistemic metaphor to overcome the barriers to SME strategy–making which is being forced to rely upon the 100-year MNC-centric knowledge-base.

6.1 Definitions of terms and concepts used in this Chapter

DNA – knowledge spectrum is defined as the metaphor used for the structured aggregation of strategy – making building blocks. Technology spectrum is defined as the portion of technology generated conceptual approaches for strategy – making.

Ascent Routines – are defined as the progressive acceptance and mindset advancement I – O routines are defined as the Inputs, Processes and Outputs that are typically utilized by the Technology and IT industry sectors in the fulfilment of their operations.

6.2 Bloom based SME Learning with Technology Enabled Business Strategy lessons

The deployment of the assessment with the Bloom Taxonomy criteria intensifies as a result of the conceptual integration of the Taxonomy with the conventional "I – O" analysis that characterizes the Technology sector.

Figure 6.1 for example illustrates the Bloom criteria for learning to utilize the Technology spectrum (on the left of the diagram). While this is the common criteria to be applied to all the four knowledge metaphoric chromosome with Technology. The traditional Input – Output analysis (or I-O criteria illustrated on the right) of the IT sector for example can be of equal importance at the least. The assessment for the Research Question therefore integrates the two criteria in the quest to deliver a meta-model that can be customizable and configurable to satisfy SME – eGID relevance. The integrated criteria approach seeks to also highlight the challenges that SMEs would face in the quest to transform the physical into the virtual world.

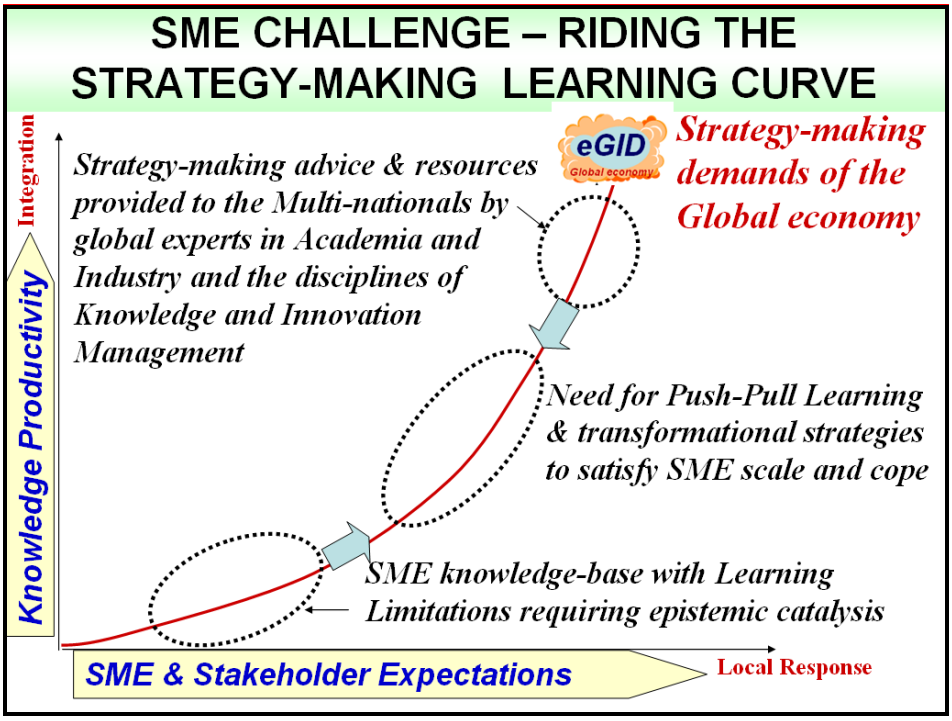


Figure 6.1 – Integration of Bloom Taxonomy with Bloom's Taxonomy

6.2.1 Background and Model for Assessing Learning Challenges

The world of technology has been acknowledged as the chief among the PESTE macro-economic forces – claimed to account for as much as 80% of the productivity gains and the economic growth from new businesses and new products and services. It can be argued that Academia struggles to keep pace of the breath – taking pace of change and the dynamics of the sector and its strategy – making information and implications.

Fortunately the Technology – Industry players have taken up the role of information generators, even if it is in their self interests to educate the community at large and their potential customers in particular. Figure 6.2 illustrates the strategy – making role that the Technology Industry's publications have been deployed for the assessment of the Project's Research Questions. In the centre of the diagram Figure 6.2 lists some of these publications that include Technology Reviews, White Papers, media announcements, successful Patent application notices, etc. The SME – eGID challenges is to utilize these publications and their topics on new systems, products, services, etc – as the epistemic feedstock for strategy – making.

6.3 Epistemic Model for Problem Analysis with Industry Contributed Strategy Lessons

The major realization from the review of these technologies – Industry publications is the sheer scale and magnitude of issues – in their levels of intensity, depth of cover, and their pace. The

"Technology – chromosome metaphor" used for the represented collection in Chapter 2's Literature Review is but a miniscule fraction of the full Technology- spectrum.

The Research Project therefore seeks to address the strategy – making in the context of IT – system Technologies because it is one of the most active sectors within the total Technology – spectrum. Figure 6.3 therefore seeks to illustrate the SME challenge in the context of a 3-dimensional arrangement of factors for consideration. Apart from the vastness of the "I-O" issues, the opportunities – and challenges of "outsourcing" of technology and IT – services emerge. Increasingly the Post – 2000 era of Technology management have seen MNCs resort to IT – outsourcing as the most rapid and practical way to benefit from the new productivity and global reach. Simultaneously, reports on issues of privacy, security, theft, vendor – lockage, and over-expectations, etc have also emerged in the Technology – industry press. Figure 6.3 is therefore used as the anchor concept to determine how and if the knowledge – chromosome can be nurtured and re-configured for SME – eGID success.

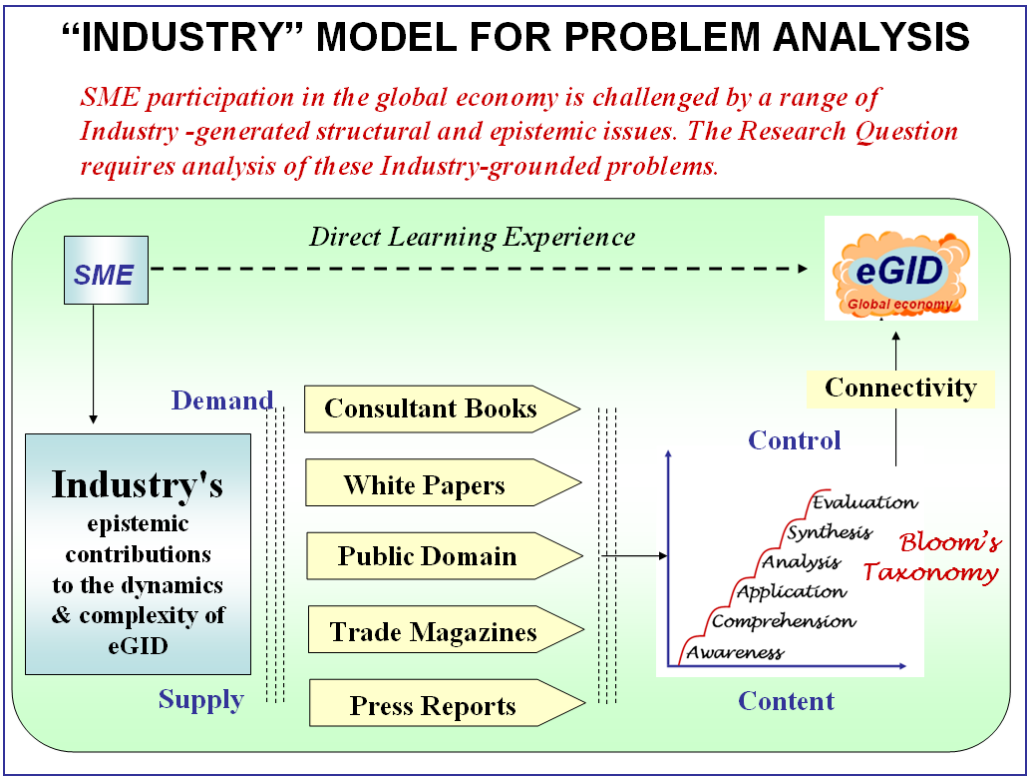


Figure 6.2 –"Industry" model for problem analysis

In Figure 6.2 we present the Analytical Model that represents the "Industry" context of the barriers challenging SME in the global economy. Barriers exist in utilizing the sub-sets of the industry-generated content that are responsible for the dynamics and complexity of the global economy.

6.4 Awareness Problems Preventing use of Strategy-Making contributions from Industry

The magnitude of the total Technology – spectrum is further complicated by the need for SMEs to view its variation and functional claims in the context of the epistemic business models that were created in the past 100 – years (the legacy spectrum).

SMEs face major challenges with the need to first review the Technology – spectrum landscape and their identify their roles and functions for consideration within the framework of the legacy – accumulated Pre-2000 business models.

Figure 6.3 for example is a valuable concept from the Pre-2000 era which can assist in awareness building of the scope for technology – generated SME – eGID strategy-making. The challenge however is to present the different Technology groups and their offerings within these categories.

Outsourcing at various depth levels and across horizontal functional disciplines complicates the role of who really is the supplier, or the buyer or end-users. Industry Reports and announcements on new products and services further cloud the issue of whether they are the actions of a New Entrant or substitute products.

The Awareness barriers are further impactive with mergers, acquisitions and the ownership changes that are not evident with brand-name retention of the acquired firms.

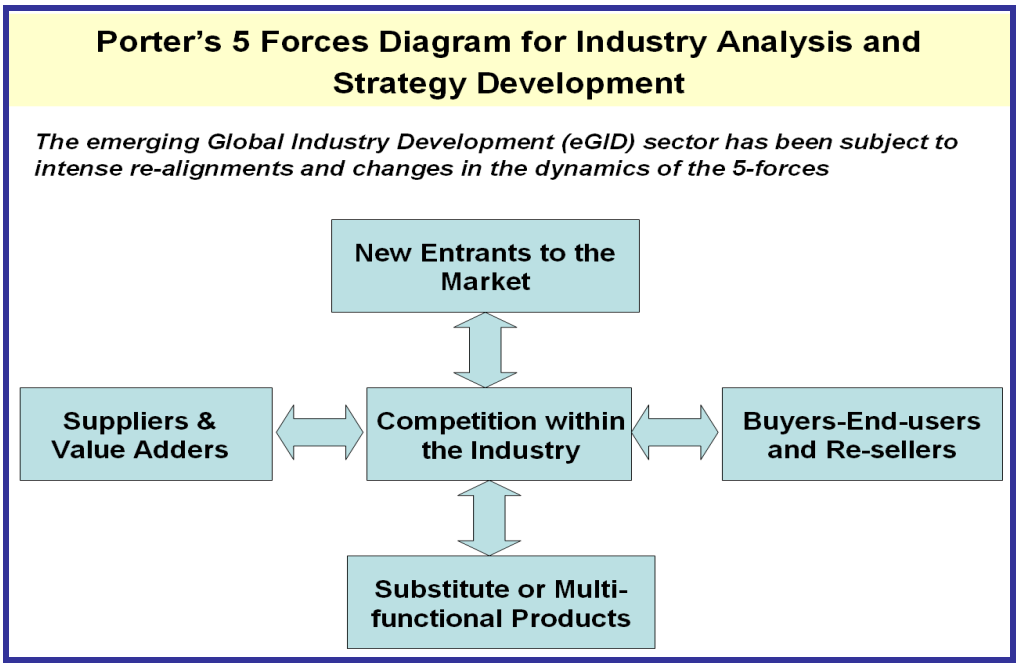


Figure 6.3 – The challenge of recasting the Technology spectrum into Pre-2000 business models

Risk-related Awareness Barriers

SMEs can be good risk – takers in their native territory of commerce or manufacturing. However when exposed to the full landscape of risks, they do shy away from risk taking on the basis or

justification that they are now aware of the seemingly endless chain of risks that would need to be managed.

A further challenge is advancing "Awareness" levels to the extent where patterns can be identified in the variations of the Porter Value chain and the Supply chain network and derivatives, comprising of:

- Demand driven supply chain
- Vendor managed supply chains
- Lean and agile supply chains
- ODE Technology based chains – other business 2.0 derivatives

Lack of awareness of the IBM-service model (which delivers outsource contracts to MNCs or their Supply-chain derivatives in a total turn-key service) is caused by misconceptions and Pre-2000.

In Figure 6.4 for example the "Risk" – related Awareness challenges can be seen to exist in the entire supply chain network. SMEs need to be aware (to the level of being fully convinced) that technology – based strategies can indeed monitor real time demand and respond to deliver fulfillment even in globally dispersed markets. SMEs more than MNCs cannot afford the costs of oversupply, undersupply, or delays in the fulfillment chain, despite the potential and dynamics of PESTE disruptions.

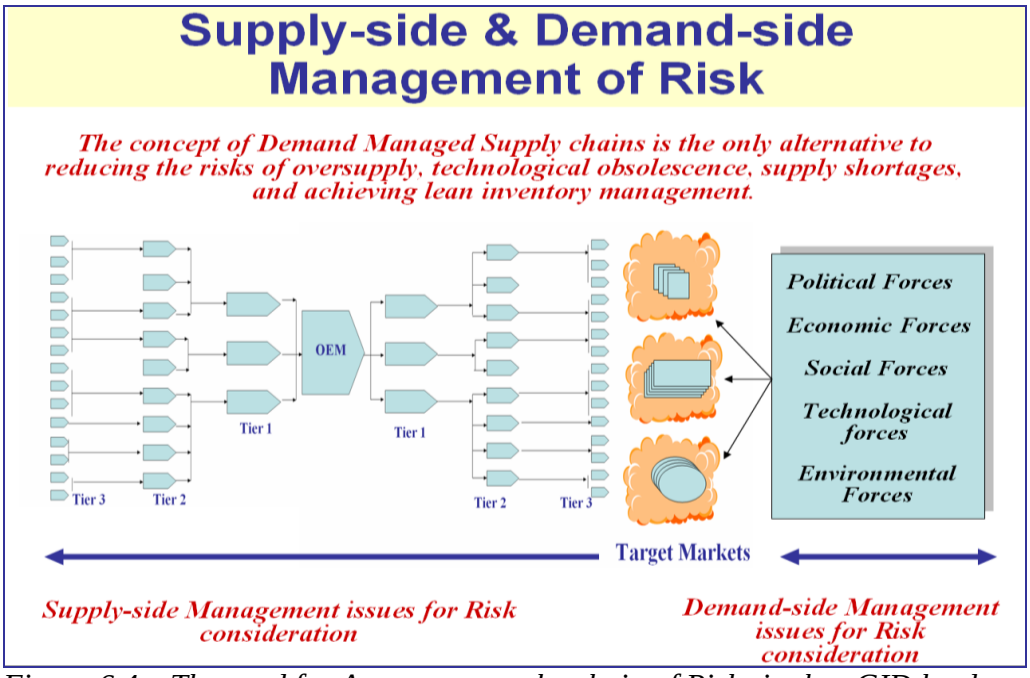


Figure 6.4 – The need for Awareness on the chain of Risks in the eGID landscape

Figure 6.4 illustrates the need for Awareness of the Risk Management perspective that can change the entire epistemic landscape for business strategy making. Every segment within the Porter Value Chain based supply chain is subject to its own portfolio of risks and hazards and

SME strategy-making must address these challenges that are subject to changes in IT-technology in particular.

A further "Awareness" challenge that creates demands on SME attention – retention and monitoring of ongoing developments can be visualized with the strategic – management role delivered by Amazon.com. In the Pre-2000 era, Amazon was simply a discount book-seller that utilized the Internet for its delivery system. Increased SME awareness is required to appreciate the strategy – making lessons available from Post-2000 Amazon.com.

Figure 6.5 – Awareness challenges on the scale of business ecosystem membership

Figure 6.5 illustrates the lessons available for SME strategy making on how the membership of the business ecosystem needs to be mobilized to service the expanded range of globally dispersed supplies and customers. It also specifically requires the coordination of the mindsets of the membership. While the intra-member transactions taking place can be generally worked out, what is not visible is the strategy-making that resulted in the establishment of this business model. The need for SME awareness therefore transfers into the awareness – needs of the multiple lessons embedded within "thought-leaders" and eGID's well accomplished innovators.

The "awareness – lessons" from the Dell's "Direct – scale" model of Figure 6.6 are numerous. The need for seamless – synchronization among the ecosystem membership is of specific value to SMEs because more than MNCs, the SME entity must reply upon multiple – entity participation.

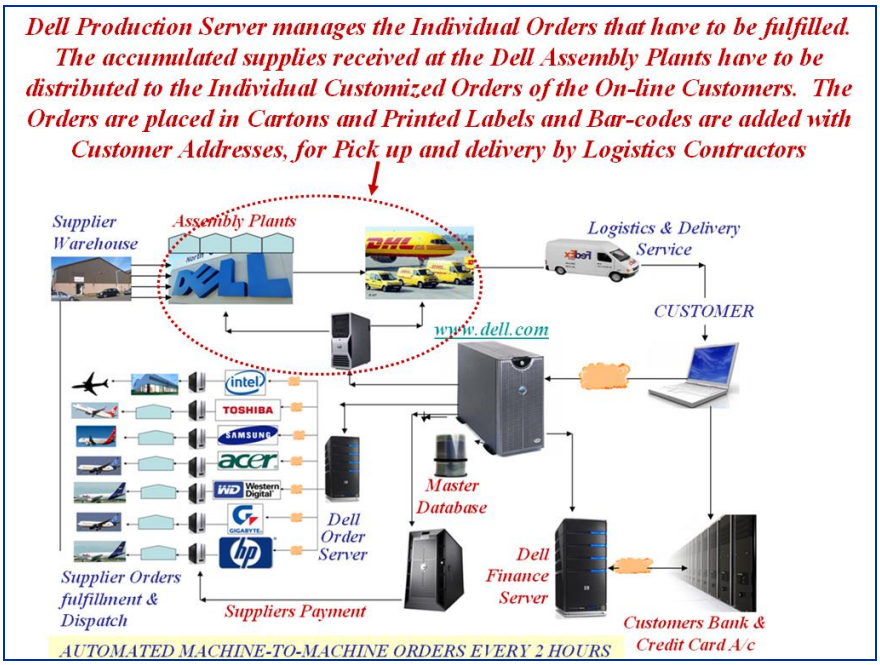


Figure 6.6 – Awareness challenges on the synchronization demands for eGID success

6.5 Comprehension - Problems preventing use of strategy-making contributions from Industry

Beyond the "Awareness" stage, SMEs need to develop a comprehensive understanding of the different hardware and software assets that make up the total systems. The Post-2000 business strategy basically seeks to create a unified product – service that is composed of multiple technologies and inputs from multiple entities within their Post-2000 business ecosystem.

A key challenge to SMEs is the development of such a capacity to match the speed and velocity of the global markets. The average life cycle of the mobile phone for example is less than 2 years, when compared with the 70 years of the circular dial phone. While the need for speed, velocity and agility cannot be argued against, the key determinant for SME consideration is the business position from which it should seek to embed these characteristics within SME strategy-making and the required ecosystems.

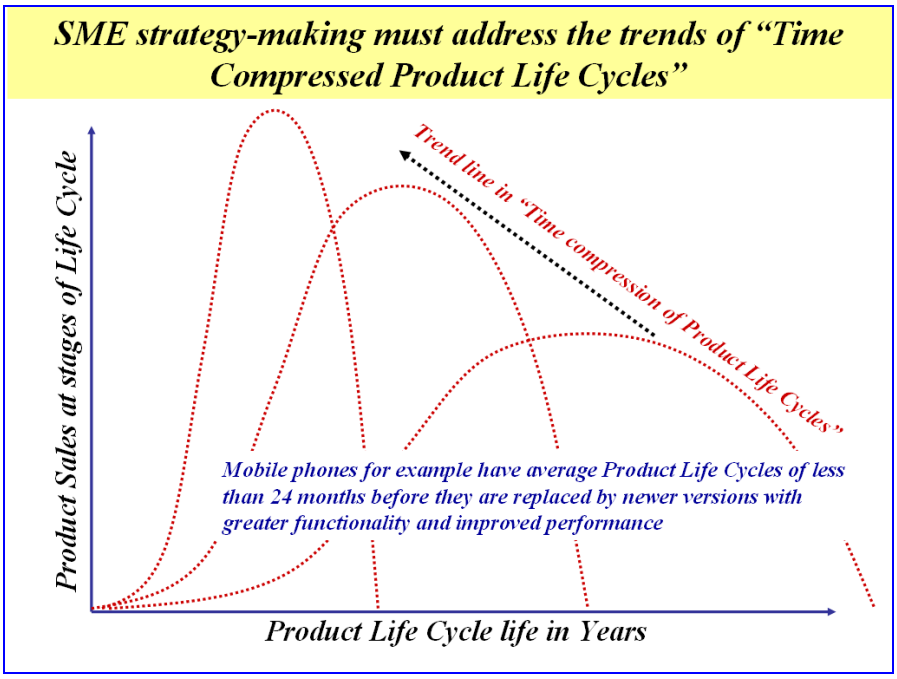


Figure 6.7 – The epistemic demands on shrinking Project life cycles of eGI products

Figure 6.7 for example illustrates the ever reducing time-scale that needs to be considered by developers of products or business concepts before its value (within the embedded customer value propositions) is either made redundant or is superseded with lower cost and higher-value alternatives. The main challenge is for SMEs to decide if they are to be a product manufacturer or a manufacturer of service packages, on an organiser.

The need for comprehensive levels of knowledge is confirmed by research at the Boston Consulting Group (Stalk 2008) and their arguments for the use of "Disposable Strategies" that are required to cope with the dynamism of the global markets. Disposable manufacturing, and short production runs, and test marketing form part of the range of disposable strategies recommended for Multi-National Corporations. While the concept is valid for the current global situation, the problems in SME adoption of the recommendations can be significant, as illustrated in the table below.

"Disposable Strategies" recommended for MNC participation in the global economy	Problems confronting SME utilization of the "Disposable Strategies" concept – from the context of a product supplier
Supply Chain gymnastics – with flexibility to switch between products, markets, time-frames and achieve first mover advantages – on a continuous basis	Addressing supply chain deficiencies from the SME perspective is relatively a theoretical exercise. SMEs do not have the commercial power to make changes beyond brining the opportunity for change to the notice of the OEM or the overall leader of the business ecosystem. The strategy would be relevant if the SME is the developer of a product-service with responsibility for implementing the entire

	fulfillment program
Side-stepping Economies of Scale advantage with disposable factories and outsourcing and new approaches to mass production capabilities	SMEs do not have the option to invest in a series of "investment gambles" or investment options and then adapt a wait and see approach to determine the best suited option that develops. Disposable factories and the investments required for even the smallest scale is beyond the investment capacity of typical SME especially if there is the likelihood that the disposable factory may indeed be disposed of in the very short term at a loss to the investment.
Dynamic Pricing – by responding to customer's immediate needs and priorities and delivering value in exchange for higher pricing models	SMEs first need access to understand the dynamic needs of potential clients and only thereafter can the SME offer higher pricing options. The call for the use of Disposable Strategies does not explain the context or the implementation mechanisms for SMEs to work around these barriers
Embracing complexity-developing and making management more agile in their thinking and embedding the speed of response into their strategy-making plans and business operations	SMEs are well positioned to deliver rapid responses and to satisfy the agility or the speed of reaction segment of the advice. However the required training and investment in business infrastructure and in business analytics type application programs are beyond their capacity. Even with the availability of Cloud Computing and Software-as-a-Service systems, the main problem is the recruitment and approval of the membership of the supply chain network or the ecosystem membership to collaborate with managing the complexity.
Infinite Bandwidth and the capacity to utilize the web with new approaches to strategy-making and operational execution	SMEs attempting to utilize the web for its capacity to deliver visibility, mobility, authenticity, and instant communications will have difficulties depending on whether they are a part of an existing business ecosystem, or whether they have to start a new business operation offering a new customer value proposition. As existing members, the SME will need to comply with and follow the rules that are set for the entire membership fo the ecosystem. With starting or offering new business value propositions, this strategy could well deliver the benefits of "internetized" services that can exceed the capacity of the MNC.

The time – sensitivity of Post-2000 products therefore demands that SMEs invest in gaining high levels of awareness in related technologies.

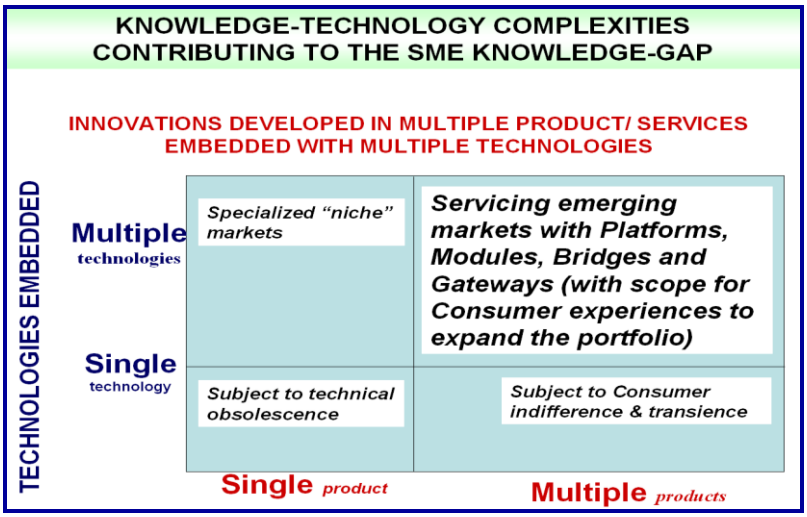


Figure 6.8 – Technology comprehension barriers from "Mash-ups" of technology and functions.

In Figure 6.8 for example, high levels of technical knowledge need to be complemented and aggregated with skills on transforming the Pre-2000 mindsets on product functionality. Having divested them of their Pre-2000 delivery systems, the new innovative product range can be developed with Post-2000 technologies.

In the gird of Figure 6.8, SMEs therefore need to advance into the top right corner of the quadrants. Here SMEs would be able to offer multiple – products with multiple technologies embedded within them. Only comprehensive – level knowledge can transform the SME product portfolio from its single – product – single technology limitations.

6.6 Application - Problems preventing use of strategy-making contributions from Industry

The "Application" – generating challenge to SMEs with the "Technology – chromosome" extends beyond new product or a series of single product developments.

The Post-2000 challenge is for delivery of value – adding integration of products and services. The SME challenge is therefore to creatively develop "Mash-up" equivalents. Almost every physical activity of the Pre-2000 era should be the subject for Technology – enhanced innovations. Figure 6.9 for example provides an example whereby the "Food Services Industry" are transforming themselves from a manual – paper based food – carting services into a real-time mediator and value adder strategically positioned between OEM food manufacturers and their corporate retail customers. The manner in which technology delivers the "aggregating – disaggregating – reaggregating" roles are explained further.

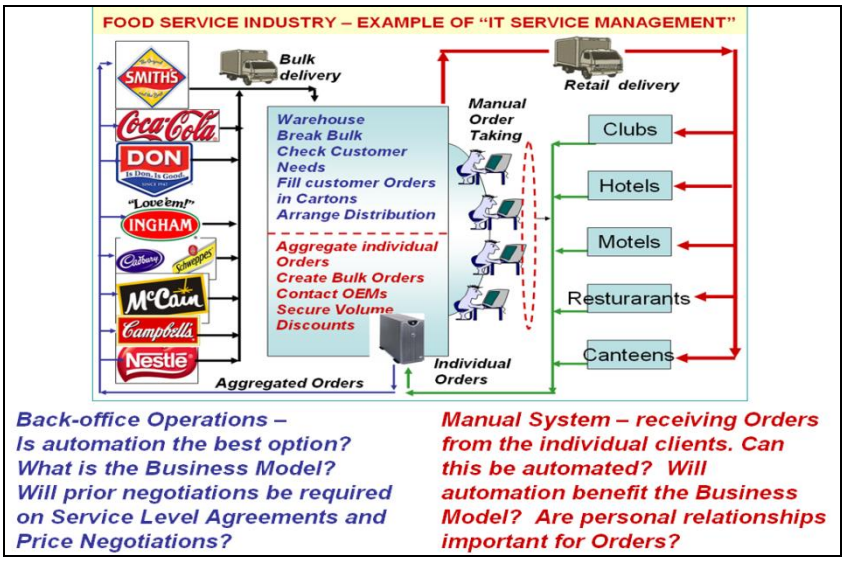


Figure 6.9 – The role of Technology in Aggregating demand and Disaggregated retail sales.

A "front-end" retail-centric group maintains daily or even hourly contact with the end-users or consumers of food products (shown in the far right of the diagram). Individual orders received are aggregated by real-time computer systems. Aggregated quantities in each product or brand of food can then be compared against available quantities in the warehouse. Additionally new orders may need to be placed with the food manufacturers.

Once the physical products are in the warehouse, the technology provides the information for "Breaking – bulk" and the required "Cross – Docking" with the outgoing logistics to each retail customer. Finally technology re-aggregates the payments received from the individual retailers to repay the bulk suppliers. The "Harvey – Norman" integrated franchise model works along the same principles from which SME can gain strategy making lessons.

6.7 Analysis - Problems preventing use of strategy-making contributions from Industry

At the Analysis or Decision making stage, the progressive gaining of knowledge and strategy-making lessons are put to the test. SME decision making can be tempted to consider individual contributing items or issues and this can delay the opportunity capture processes. For example, SME attention may be diverted into micro-scale analysis of the sub-units of an IT-technology-based strategy. The issues and choice of computer hardware and software selection can be a distraction of the real issue of the business transformation strategy. Issues of servers, operating systems, database options, and application program choices may also disrupt the "Business Strategy-making Analysis" objective.

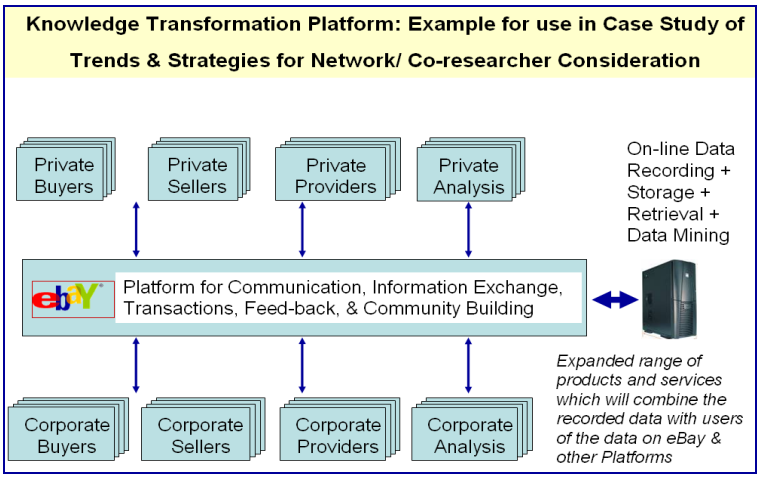


Figure 6.10 – The Reporting challenge and automated Executive Information systems

SME strategy-making with technologies therefore need to cross the "Analysis – barrier" by considering the use of "outsourced services" such as IT. SME advancement in the USA and parts of Europe for example use the "outsourcing" pathway provided by MNC organizations such as Amazon.com and eBay. They offer globally visible platforms that are available for re-configurable and customizable SME strategy-making.

In Figure 6.10 for example, SMEs using the eBay platform would need to go beyond simple listing. Business Analytical tools are provided by eBay for their business customers – so that the same level of insights and evidence can be used for SME decision – making, as by their MNC counterparts.

6.8 Synthesis - Problems preventing use of strategy-making contributions from Industry

SME-related Synthesis difficulties in using the "technology-segment" of the knowledge-base can be appreciated with the example of the McKinsey's 7-S Model for Strategy making. Their 7-S model was utilized in the 1980-1990 era by this quintessential Management Consulting firm advising the crème-de-la-crème of multinationals and global governments. Even though a business book was created to explain the model and its potential for strategy-making success, the table below demonstrates the difficulties that SMEs face in its implementation.

McKinsey's, Waterman, Peters, and Phillips 1980 presented their 7-S model to bring together and make more manageable the wide scope and coverage of the available academic models and the need to integrate the accumulated knowledge-base. McKinsey's clients were provided with the 7-key directions or perspectives needed to strategize and organize their resources.

Business Model requirements for Strategy-making proposed by the McKinsey Model	SME Strategy-making difficulties in analysing issues with the 7-S Model
Strategy making capacity-	This is the segment in which Management

Provide direction, alignment of resources, Resource Mobilization, Long term goals	Consultants offer to fill the knowledge-gap. In the case of MNC firms this is the expected step for the appointment and justification of the business consulting service that would implement the 7-S Model itself. In the case of the SME, this core requirement needs epistemic advancement beyond acknowledging the need for this service. In a way this is a epistemic circularity that the SME generally frowns upon.
Structure - **Differentiation, Organizational Framework, Departments, Reporting Systems, Expertise areas & Responsibilities**	While this aspect of strategy and organization is of direct relevance and importance to MNC firms, SMEs on the other hand have relatively few levels of staffing between the head decision-maker and the staff at the coal-face of technology or customer relations.
Systems- **Specific processes, Formal and informal activity groups of the Porter Value Chain**	The complications associated with globally dispersed units dies not exist with SME firms. Their strategy requirements are modest compared with the MNC. Again the "core" strategy-making innovation creating idea is what the SME lacks. SME resources do not exist to be deployed in the downstream organization of the transactional activities
Staff- **Organizational Culture, Human Resources Management**	At less than an employee count of 100, SMEs seeking to use the Model would generally prefer that the focus of the strategy-making consulting deliver strategic-concepts that its staff could pursue with their limited resources
Style- **Culture and Behavior and Leadership**	SMEs would instantly acknowledge the importance of this requirement in the same breathe as they would seek a cost-effective path to leadership and training
Skills- **Capabilities and Competencies**	SME decision makers possess first hand knowledge of their technical and commercial experts. This situation is different from the MNC context where competencies and capabilities remain relatively hidden under layers of hierarchy
Super-ordinate Goals- **Innovative thinking**	Most SMEs would simply return to the circularity issue, in asking for their Management Consultant to go beyond the identification of this requirement, with actual customizable examples for delivery of innovation.

The above table is a further example of the difficulties faced by SMES in tyring to make direct use of the 100-year-$1 Trillion knowledge-base.

6.9 Evaluation - Problems preventing use of strategy-making contributions from Industry

It is argued that once the SME can advance beyond the "synthesis" stage, SMEs would be better available to make use of the Post-2000 opportunities for technology-generated strategies.

While the Technology provides the production base and the launch platform, issues of motivation, ideation and collaboration management still persist. In this context Figure 6.12 presents a further "grid" type approach that can assist SMEs to better evaluate the technology's potential for strategy-making.

Transforming business operations

Essentially technology offers the potential to totally transform and re-frame an entire business in all of its business functions, delivery systems and customer relationships. In the Post-2000 ear, technology does in effect offer the "Big Bang" approach, and it is this transforming potential and nature that can be decisive in its SME uptake.

Figure 6.3 for example offers SMEs the "Big Bang" approach so start again and re-invent itself for the Post-2000 era of customers, competitors and ecosystem partners. The degree to which SMEs evaluate and accept the concept of "digitized chains" is a good surrogate to determine if they will accept the full scope to re-invent themselves.

Lessons from the MNC adoption of these platforms and the new generation of platforms made specifically for SME – type start-up entities must from part of the evaluation of the Technology – chromosome.

Research Case Study Analysis – Factors to evaluate the knowledge-generated Generative Capacity for Export Propensity Enhancement	Generative Motivation	Generative Ideation	Generative Collaboration
Production Platforms			
Technological Platforms			
Fulfilment Platforms			
Production Chains			
Fulfilment Chains			
Modules			
Development Cycles			
Ecosystems			
Business Models			

Figure 6.11 – Strategy-making from the integration of Generative Motivation, Ideation and Collaboration.

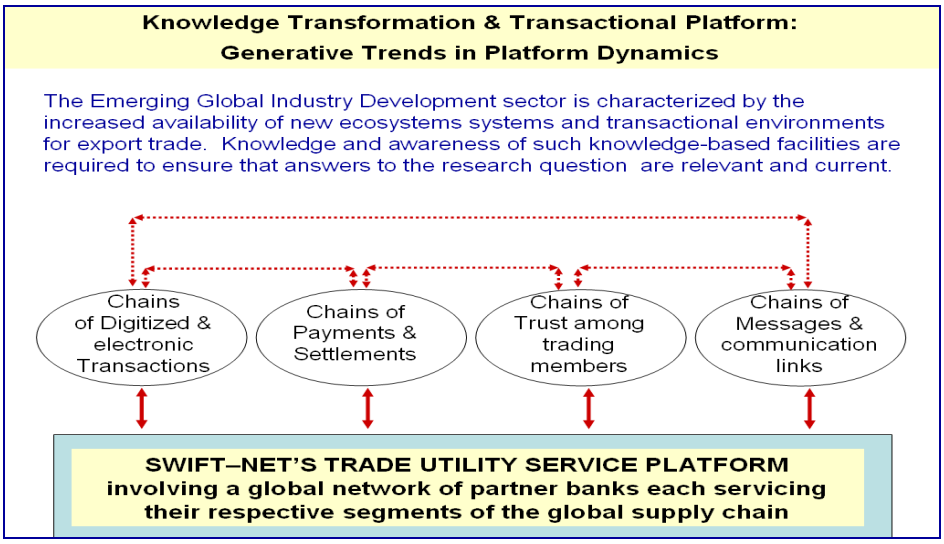


Figure 6.12 – Technology Transformation challenge for SME strategy-making

6.10 Conclusion - Problems preventing use of strategy-making contributions from Technology

The Research argues that the first decades of Post-2000 era could be characterized in the future as the period during offered unique strategy-making resources from the global technology sector.

The extent to which SMEs take up the facilities and integrate their competencies and skills will significantly determine if intensive SME – eGID participation will become a reality. In this context SMEs need to blend their physical innovative constructs with the Inputs and the Processing systems and Outputs specifically from the IT – Industry sector. SMEs need new skills competencies for the Aggregation Disaggregation, and Re-aggregation of the different functional chains.

Digitized versions of:

(i) The Product Manufacturing Chain
(ii) The Delivery Chain
(iii) The Financial Chain
(iv) The Risk Management Chain, and
(v) The Governance and Control Chain,

appear to be the minimum competencies for SME-eGID strategy-making.

The Research acknowledges that the typical SME is well positioned to learn fast and gain a rapid appreciation of the main driving factors offered by the technology-chromosome. However a doubt remains whether the typical SME would be given the time and the resources to learn the key issues that have been presented in the context of the Bloom Taxonomy and its challenges.

6.11 Chapter Conclusion

This Chapter has presented the case for SMEs to actively deploy a range of new web 2.0 and Internet/ computer based programs for the generation of technology-based SME-eGID strategies.

It completes the second of the four Chapters to assess the barriers from the four "Chromosome" – segments of the 100-year - $1 Trillion Information Tsunami knowledge base. The chapter has used the metaphor – generated thinking of the DNA-molecular Biology sector in order to highlight the need for pure theoretical business models (most created in the Pre-2000 era) to be upgraded in combination with the innovative models and approaches of Post-2000 global business.

The DNA – knowledge spectrum metaphor and the integration of Pre-2000 and Post-2000 epistemic constructs can be extended to the innovations from Bio-engineering with Organ Transplants and Tissue Engineering.

In Post-2000 surgery, the infrastructure and the scaffolds of the organs from donors (Pre-2000) are re-used and re-pepulated with the cells of the receiver. The innovative combination offers greater scope for success, because the rest of the human body is more likely to accept the consolidated organ. Anti-rejection drugs with their side effects are not required. The new cells shaped to the frames of the scaffold can function almost immediately.

In this Chapter, the same lessons have been presented. The frames and scaffolds of Pre-2000 need to be separated from manual based thinking, where every stage was forced to occur in a series format. The scope for successful infusion of the Pre-2000 models with the technologies of Post-2000 has been demonstrated by the evidence presented from pioneering MNC applications.

The challenges posed by the Research Questions can only be realised by SMEs being able to achieve this Post-2000 infusion by the commitment of time and resources. It is in this context that the Chapter proceeds to the assessment of the "knowledge – enabling" strategy-making base.

In Chapter 7 therefore the Research Question will be framed to determine what types of knowledge – resources would be required to cross the barriers for Technology – business model adaption and transformation.

CHAPTER 7 BLOOM BASED KNOWLEDGE MANAGEMENT

7.0 Introduction

This Chapter presents the third group of business model creating building blocks to asset its potential to assist SMEs with eGID relevant strategy-making.

We have used the metaphor the human DNA spectrum as the model for the 100 year $1 Trillion accumulation of such business creating models and constructs. We have termed the accumulation as the Human Knowledge – spectrum and we have broadly categorized them into four epistemic chromosomes on the basis of their common relationships. This Chapter focuses on the "Knowledge Management" chromosome in order to assess whether its protocols can facilitate the required strategy-making for SME-eGid engagement.

We utilize the Bloom's Taxonomy to assess this scope to reach the conclusion that the knowledge management chromosome has limited value if its focus is restricted to transactional or procedural issues in Post-2000 business strategy. The Chapter thereafter presents an alternative perspective of knowledge which is based on the epistemic generative and transformative functions and lessons being developed by Post-2000 systems biology.

The Chapter concludes by the need to apply the new knowledge generating perspectives to the "Innovation Chromosome" in Chapter 8.

7.1 Definitions of terms and concepts used in this Chapter

Convergence of knowledge is defined as the capacity to integrate knowledge constructs into a structured continuum of usable knowledge. Divergence of knowledge is defined as the separation of different streams of knowledge which may have been embedded within a construct but which requires deconstruction for possible use of the constituting elements.

Knowledge chromosome is defined by this Projects ad-hoc categorization of knowledge management protocols that have been presented in Business Management studies.

Convergence phenomena is defined as the observed potential for Post-2000 artifacts to be usefully integrated on the basis of their commonality.

DNA – is defined as the scientifically based chemical/ molecule "DeOxy-Ribo Nucleic Acid" – which consists of the sequences of the four information containing nucleotides A, G, T, C Protein – Coding Genes are defined as segments within the DNA molecule whose specific sequences of the A, G, T, C nucleotides are primarily responsible for the eventual synthesis of Human proteins.

mRNA – is defined as messenger RNA that conveys the information codes from genes within the DNA molecule for the production of its designated protein.

7.2 Blooms Taxonomy with Knowledge- chromosome

Knowledge Management Domain Background

The case has been presented that the knowledge, information and data necessary for strategy-making need to be developed through an epistemic ascent routine to achieve the required value addition. The Bloom's Taxonomy of Learning has also been presented as a methodology for achieving the high order thinking by progressing the knowledge elements through the ascent routines.

Epistemic elements from Academia and the Technology sectors were presented in Chapters 5 and 6. In Chapter 7 we focus on testing the capacity of the Knowledge Management Movement's protocols to assist with knowledge – element integration.

The concept of epistemic convergence is recognised as the key driving factor for integration of concepts and artifacts. The convergence mechanism seeks to unify disparate constructs into usable molecules or functional entities. It is therefore argued that the concept of convergence should be applied to the Bloom Taxonomy criteria.

Figure 7.1 is used to illustrate the integration of the convergence mechanism with the Bloom Taxonomy to determine if SMEs can use selectively integrated Pre-2000 and Post-2000 elements for high value strategy-making.

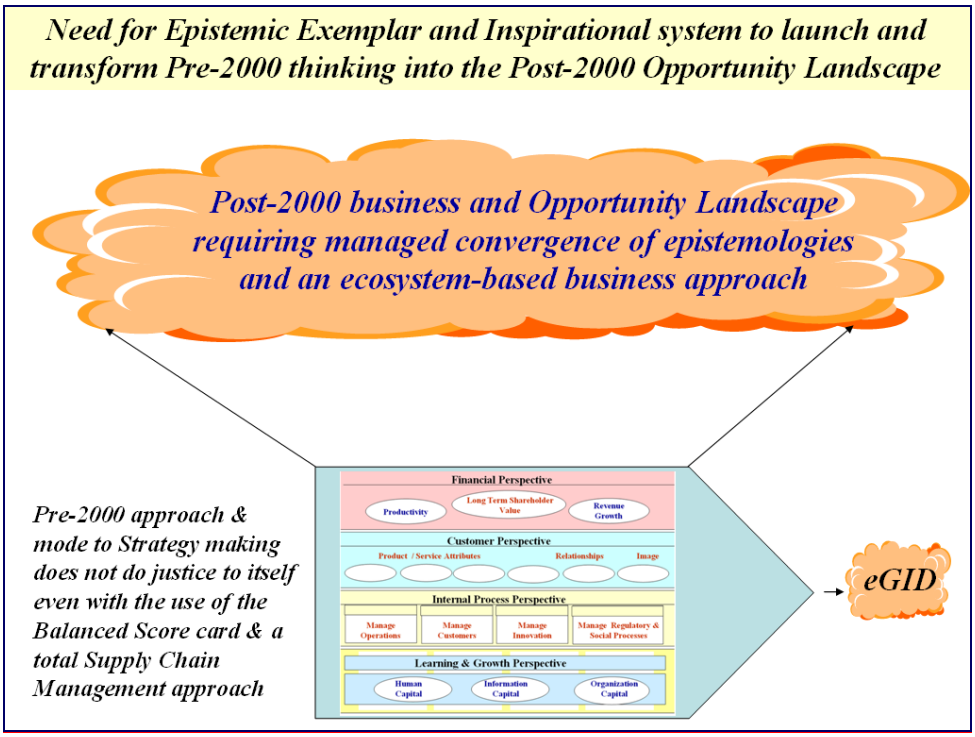


Figure 7.1 Integration of Pre-2000 and Post-2000 elements for high-value strategy-making

7.3 Blooms Taxonomy as the Metrics for Theoretical Oriented Business-strategy making

The assessment of the DNA – Knowledge Management chromosome therefore requires consideration of:

(i) The knowledge – management elements and protocols that make up the metaphorised knowledge – chromosome

(ii) The application of the convergence phenomena that seeks to unify segments within the chromosome and outside with its mechanisms of shared identify, interconnecting concepts and their connectivity potential, and

(iii) The Ascent Routines of the Bloom Taxonomy to determine if SME – eGID strategy – making can be achieved within the framework of conventional training and learning from academic and business facilitators.

7.3.1 Problem Analysis with Theory contributions and Lessons

It is therefore necessary to illustrate the logical flow of the required assessment routine.

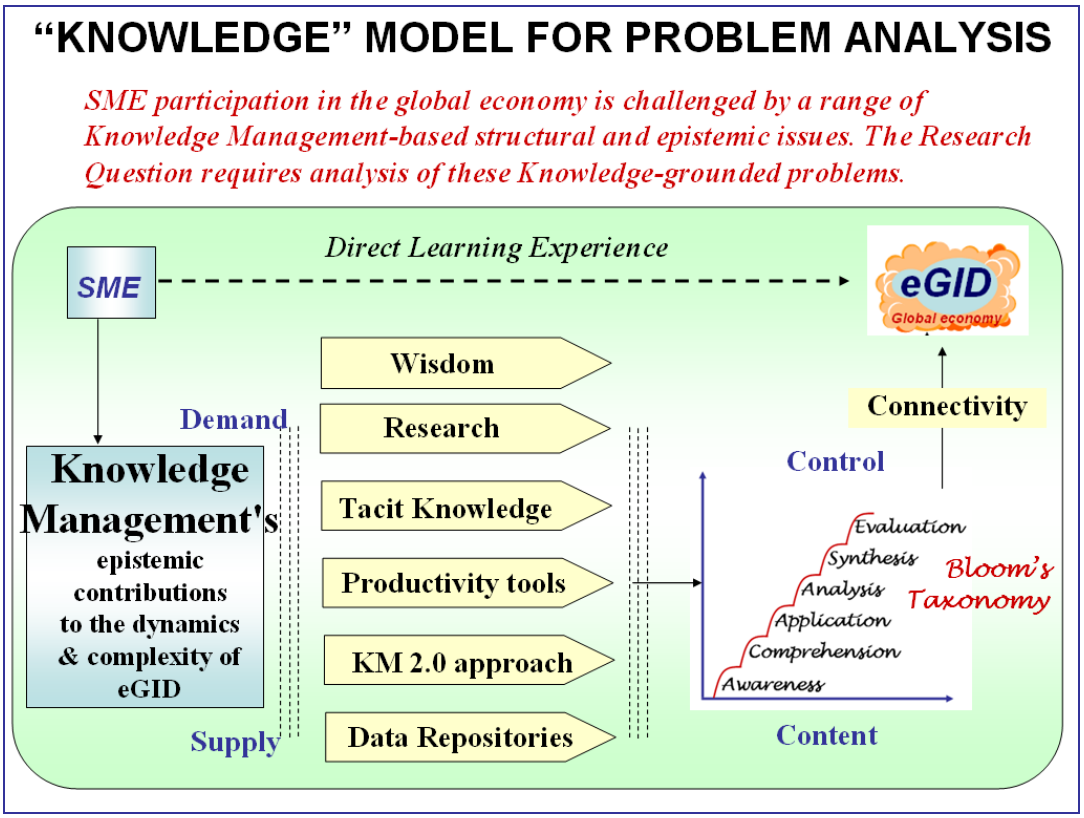


Figure 7.2 – Epistemic Model for Problem Analysis with Knowledge Management contributions to Strategy-making Lessons:

In Figure 7.2 we present the Analytical Model that represents the "Knowledge Management" context of the barriers challenging SME in the global economy. Barriers exist in utilizing the sub-sets of the Knowledge management content that are responsible for the dynamics and complexity of the global economy. The Knowledge Management Movement of the 1990s was largely responsible for the creation of portfolio of Knowledge Management protocols and knowledge aggregating procedures. In the centre of the diagram of Figure 7.2 are some of these protocols and statements.

Data Repositories for example were structured libraries in which knowledge or information on categorised topics or subjects could be stored. The initial focus of the Knowledge Management Movement was soon formed to be limiting because of its data – centric perspective. Progressively the Movement focused on the Human Person (People – centric KM 2.0). In the Post-2000 era, the focus continues to be on the sharing of knowledge at the personal level that can be facilitated by technologies.

The challenge posed by the Project's Research Questions are whether these protocols and procedures are of relevance to SME – strategy-making and to determine if these are any missing elements that have not been a part of traditional teachings in Academia or Industry.

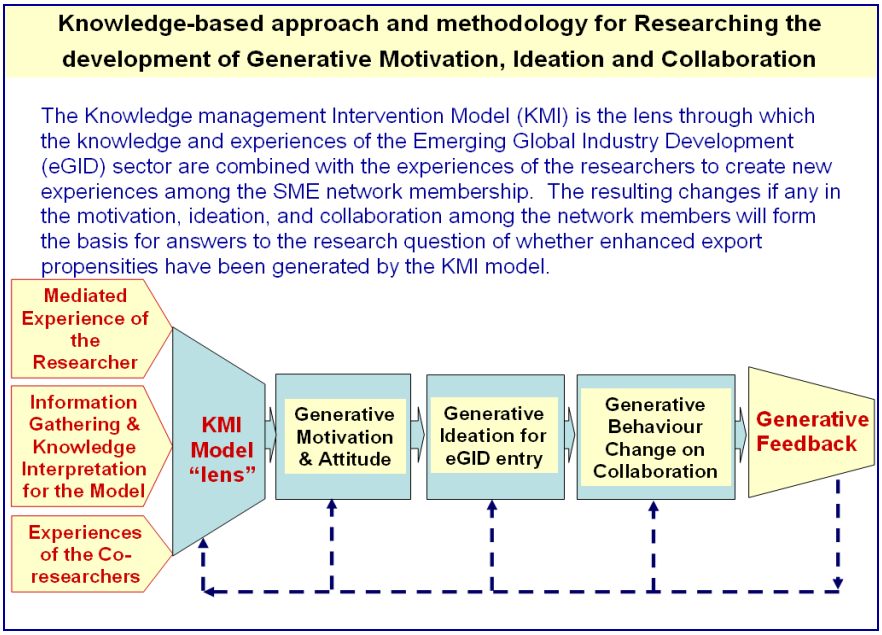


Figure 7.3 – Progressing knowledge creation through the chain of Motivation, Ideation and Collaboration.

Figure 7.3 for example illustrates the required progression of knowledge and concept integration by an early "Knowledge Management Movement" attempts to set out a pathway. In this case knowledge elements from multiple sources should be subjected to a project – specific "Tunnel" for knowledge expansion and transformation. While definitive sub-stages of Motivation, Ideation and Collaboration" are specified, the key issue is whether such structured protocols can deliver the SME – eGID model required for Post-2000 innovation.

7.4 Awareness Problems preventing use of strategy-making contributions from the discipline of Knowledge management

To ascend the Bloom Taxonomy, SMEs must be aware that there are two ways of mobilizing knowledge for strategy making, viz:

(i) The Legacy – based approach from the Pre-2000 Knowledge Management school, and

(ii) The epistemic – based approach which is grounded at the lowest level in molecular and cellular biology and related proteomics and systems biology.

In the legacy category, Drucker's knowledge workers concept was taken literally to mean that a new category or a new cadre of workers needs to be recruited. They would be the knowledge engineers responsible for creating and embedding the required knowledge within products and services. High level MNC uptake immediately followed with Chief Knowledge Management Architects being appointed by MNCs.

Unaware to the early stage adopter was the problems with Knowledge Management involving is the lack of knowledge on the Management of human interaction and the progression to the status of Wisdom. Bierly, Kessler and Christensen (2000) have argued that wisdom involves an interaction between the self and the environment and that for strategy-making to succeed there must be a system to generatee and deliver the wisdom-integration. Most SME exposure to the concept of Wisdom would have taken place in a non-technical or a non-business context. The integration of their knowledge with their individual self or mind and with the environment would be further barriers that need to be overcome.

By contrast Nature's Management of Knowledge and Wisdom are better defined in that the DNA genome, with a clear distinction between the "Protein-coding" genes and "Non-protein-coding" genes. The parallel between business and biology could extend to the Protein-coding genes being the knowledge and information that result in the intra- and inter-unit transactions that take place between corporate entities. The parallel with Wisdom could be extended to the Non-Protein coding genome. The problem however does continue because of the basic lack of a definition for wisdom in business strategy-making.

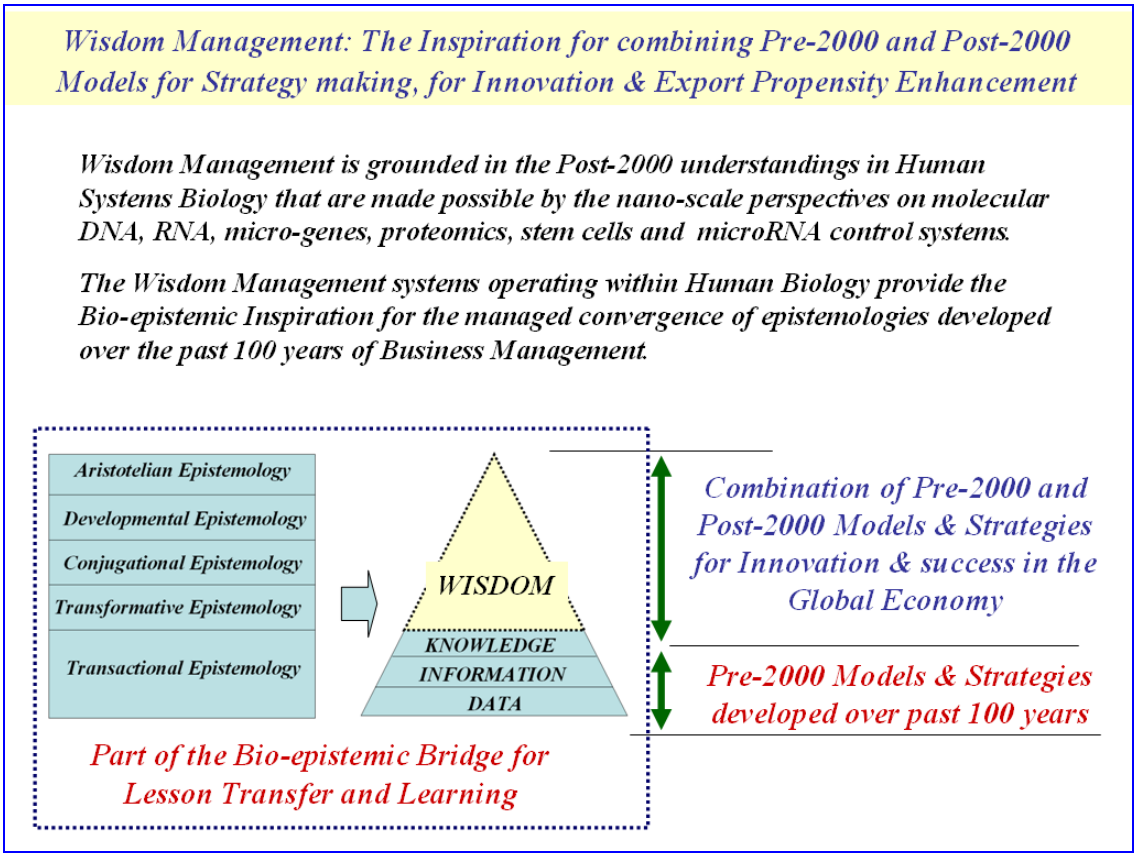


Figure 7.4 – The new epistemology of Wisdom required in strategy-making

Bierly et al 2000 confirm the problems and difficulties in knowing "what is right to do and not to do" as part of the wisdom spectrum involving the integration of our practical lives with our spiritual development. Important and valid as this Wisdom requirement may sound , SMES would have difficulties in developing their strategies on the basis that they can generate feelings of "goodness" and spirituality.

Problems with the "Awareness" requirement can therefore be re-defined as the problem of learning to use the faculty of wisdom in strategy-making. Wisdom together with Data, Information, and Knowledge needs to be managed in an integral manner, especially for decisions in strategy-making.

Wisdom – the Renaissance of the Knowledge Management Movement

In the context of SME strategy-making there is an "awareness" level need to re-define all of the legacy-based systems and their assumptions and procedures. If the epistemic ascent routines are to be productive then the wisdom re-framing needs to take play along the entire Bloom Taxonomy conditions of state.

With the Porter Value Chain of Figure 7.5 for example, the awareness of the Wisdom perspective will enable SMEs to not only "do things right but also do the right things". In each of the 9 activities of the Porter Value Chain, SMEs therefore need to attain knowledge awareness levels for not just the mechanical or transactional activities but also their meta-management

concerns. The Wisdom mandate requires human-value relationship management that needs to exceed the data and technology management relationships.

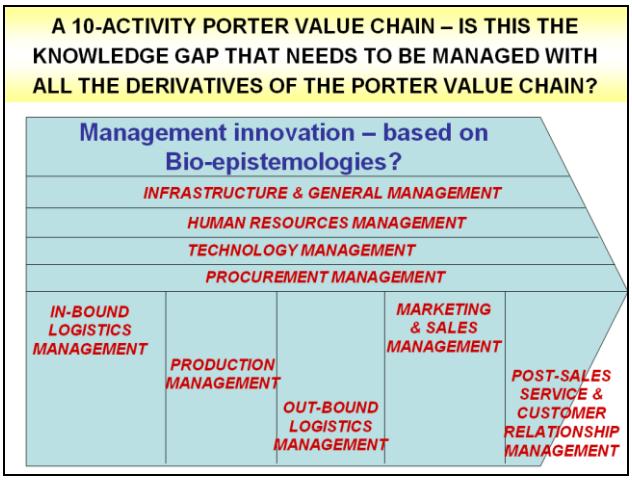


Figure 7.5 – Awareness of the Wisdom issues in the Porter Value Chain

SMEs need to make value judgments on the legacy-based protocols listed in Figure 7.5. Without a "Wisdom-awareness" support systems, SMEs risk being herded down the procedural pathways or routines that would simply perpetuate the current difficulties of SME – eGID interaction.

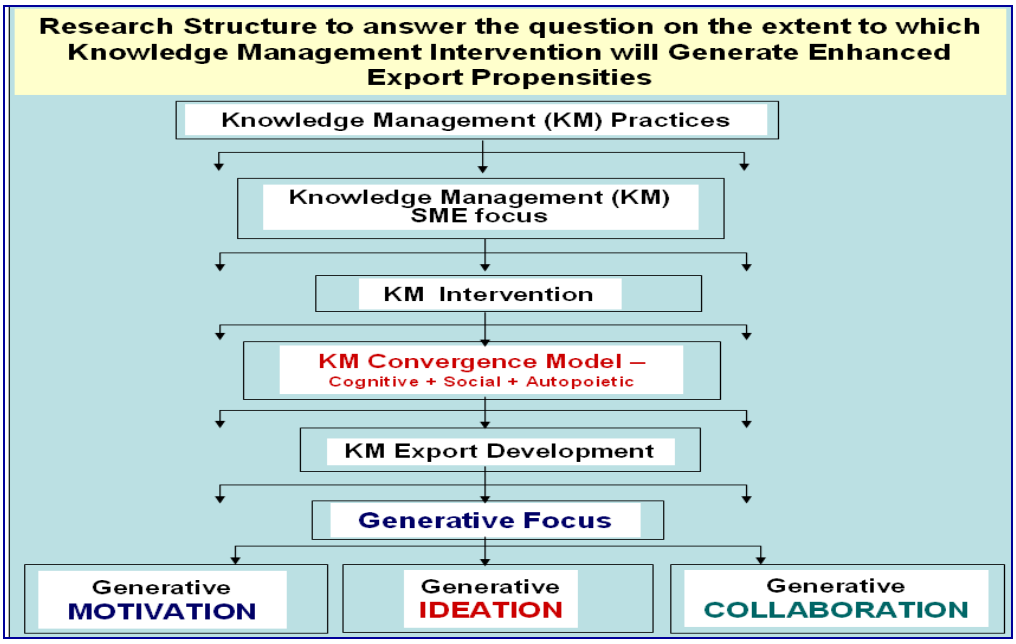


Figure 7.6 – Filling the Awareness of Wisdom vacuum in legacy-based approaches.

7.5 Comprehension Problems preventing use of strategy-making contributions from the discipline of Knowledge management

It can therefore be argued that SMEs need to achieve comprehensive levels of knowledge and supporting wisdom to give the appreciation of that knowledge. The explosion of innovative products, processes, technologies, and communication methods and delivery systems can be directly traced to the "Wisdom" factor.

This knowledge to manage knowledge needs to be developed for the SME-strategy-making base, if SMEs are to be able to similarly break-out of the Pre-2000 mechanistic thinking.

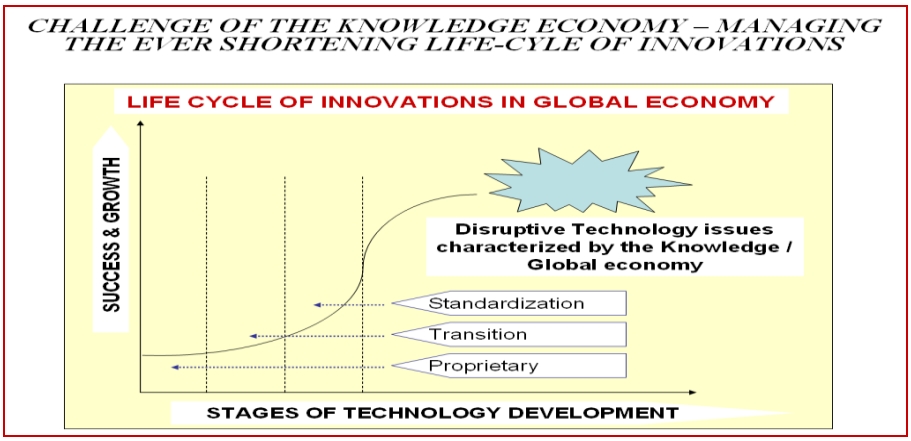


Figure 7.7 – The need for a Wisdom break-out for Post-2000 strategy making

The Bloom Taxonomy challenge at the comprehension level also requires SMEs to position themselves and the required Wisdom infusion in the context of eGID and the ever expanding knowledge gap. The Wisdom being sought directly relates to the existing SME-knowledge base – to position this knowledge in the context of where the global aggregation of related knowledge is trending for growth.

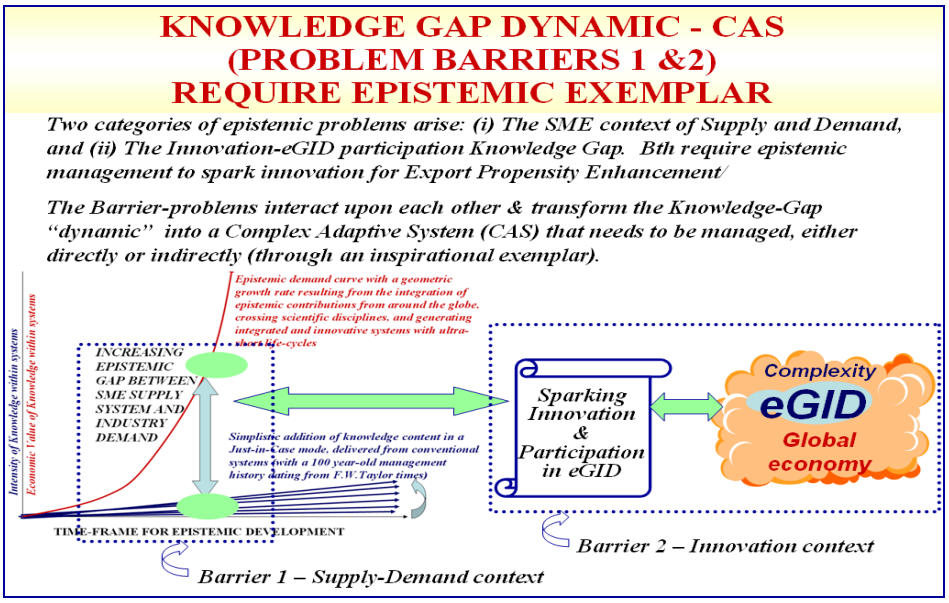


Figure 7.8 – The Wisdom factor required to address the knowledge gap

7.6 Application Problems preventing use of strategy-making contributions from the discipline of Knowledge management

Required use of metaphors and similes by SMEs is one of the key recommendations made by Nonaka, the acknowledged initiator of formal Knowledge Management Movement within Multi-national firms have been urged to follow the example of Japanese firms to operationalize the use of metaphors that can function as the intellectual reference point and the on-going motivator for the growth of knowledge within the corporation.

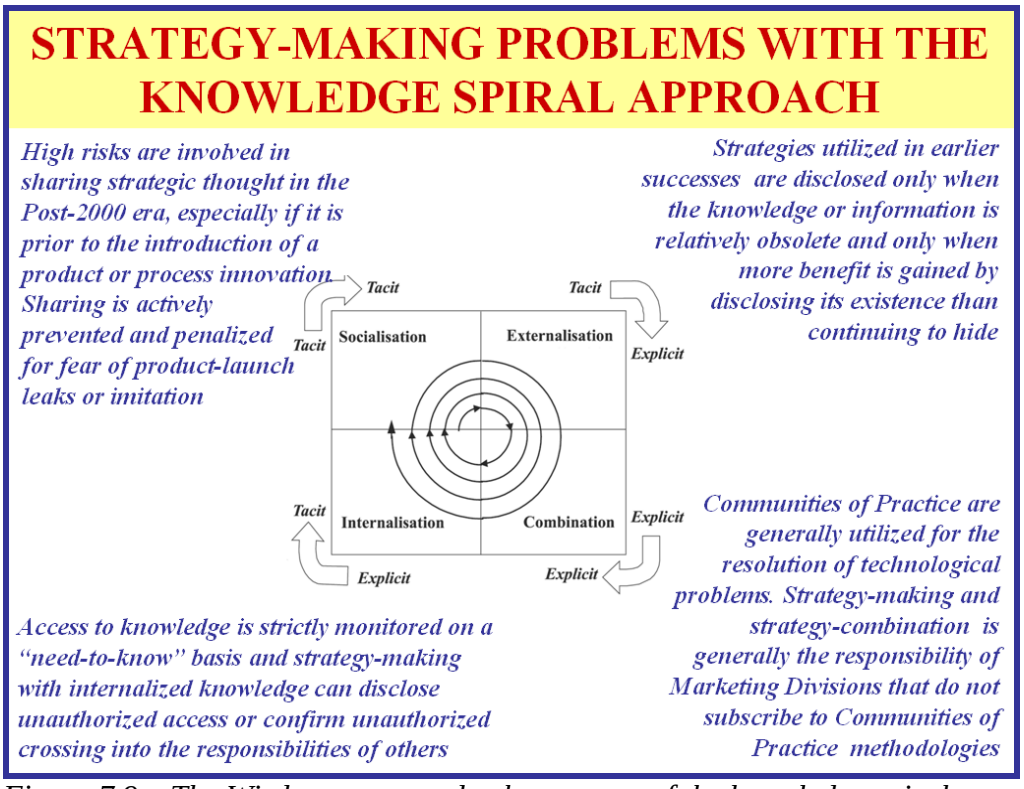


Figure 7.9 – The Wisdom generated enhancement of the knowledge spiral

Figure 7.9 illustrates the problems associated with the application of the Nonaka "knowledge-spiral" that supports the on-going interactions and combinations of tacit and explicit knowledge in order to achieve ever increasing levels of knowledge in a spiral like advance. Difficulties exist in each of the 4 quadrants when an attempt is made to develop strategy-making capabilities through the Knowledge-spiral approach. The starting point for strategy-making (at the top left) is generally forbidden especially in firms that rely on first mover advantage as their dominant strategy. The Apple Company for example relies heavily on the first mover advantage strategy and it generally has 12 -1 8 months before main steam competitors launch their products. Eventually the underlying strategy-making concepts get disclosed as represented in the second quadrant (top right). There is however a definite time delay in the disclosure and in most instances the entire details of the strategy-making process and its assumptions are not disclosed. More over what is disclosed is generally planned to provide messages to competitors and potential investors, and students of strategy may not realize the subtleties embedded within the disclosures. The epistemic feed into the third quadrant (lower right) is similarly flawed. The combination of the relatively new strategy knowledge and the experiences of the long past can therefore lack credibility. The corporate experts taking new knowledge and making it available for the next cycle of innovation suffers also from both the in-feed as well as the value of its outcomes. Moreover the process of using actual data for concept development and more detailed analysis is generally curtailed by the same IP protection. Decision-making is therefore of dubious value with the superficial application of the knowledge-spiral approach to strategy-making in the Post-2000 era.

7.7 Analysis Problems preventing use of strategy-making contributions from the discipline of Knowledge management

Global business and Post-2000 knowledge management have confirmed the need for Wisdom focused analytical considerations to be applied for eGID relevant strategy making.

Conceptual metaphors, similes, and parallels can stimulate the value of Wisdom approaches that seek to:

- Categorized the elements within the spectrum
- Compare and contrast their positions in the spectrum
- Relate their underpinnings to customer value propositions
- Present issues as part of the time-domain continuum
- Develop hypothesis on the relationships that exist or may be required

Figure 7.10 is the need to achieve the productivity potential by linking SME knowledge element to metaphors and similes.

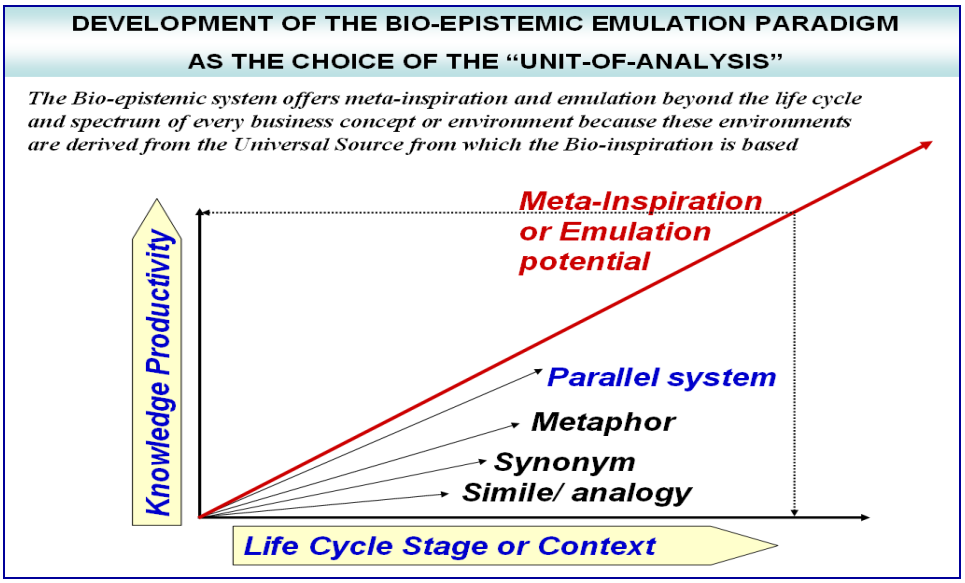


Figure 7.10 – The need for knowledge productivity with dynamic metaphors

7.8 Synthesis Problems preventing use of strategy-making contributions from the discipline of Knowledge management

Synthesis of concepts and competencies for launching innovation and fulfillment mechanisms

A key test that confirms the epistemic difficulties being experienced by SMEs is in the use of the Boisot I-space for the synthesis and convergence of knowledge elements within the spectrum. The Boisot I-space has been offered to multi-national corporations as a relatively simple but powerful framework through which innovations can be facilitated. The I-space recommends that firms seek out and establish themselves in the epistemically optimum position at the apex of the

Y-Z axis, which is the ideal position for creating innovations and new business fulfillment systems. However as explained in this section, it is relatively difficult for the SME to self-position itself in this ideal location.

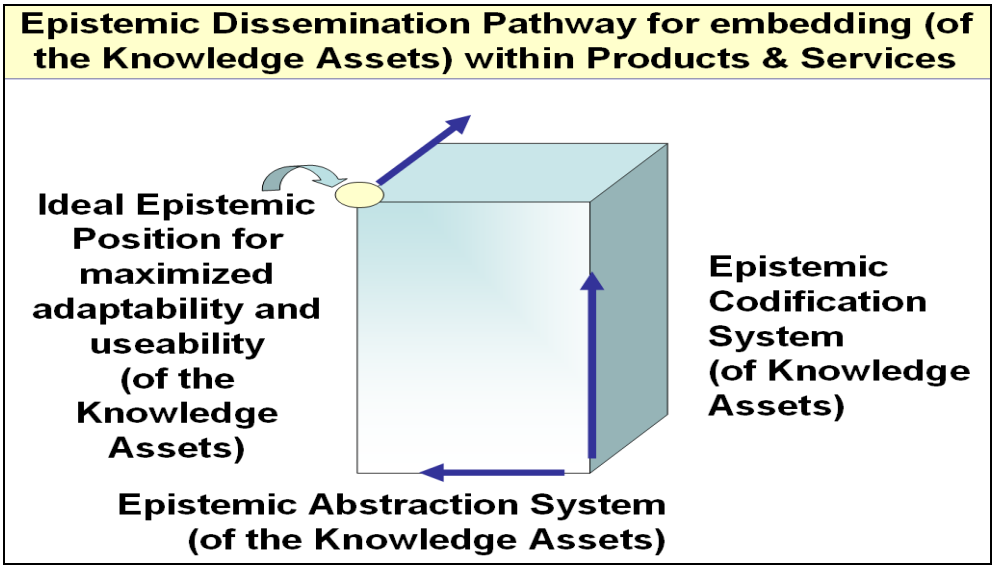


Figure 7.11 – The abstract barrier limiting SME managed convergence of epistemologies in the Boisot I-space.

As part of The Boisot I-space protocols (Figure 7.11), firms to codify and categorise their explicit knowledge and capabilities. Visualizing the 3-dimensional cube, the firm's codified knowledge can be located on the vertical Y-axis. This is a relatively well understood activity for SMEs to utilize.

The complication however arises with the Z-axis which requires the SME to develop the required catalysts or mechanism so that the SME can re-frame the capabilities and competencies in conceptual abstract terms. The complication arises when SMEs having codified their competencies along the Y-axis are at a loss to understand how and what there is to do to create an additional abstract component on the Z-axis.

As a result of the challenge to find abstract capabilities, SMEs are missing out on being able to achieve the desired or ideal launch point for considering the commercialization of the innovation and the development of convergence and fulfillment mechanisms.

7.9 Evaluation Problems preventing use of strategy-making contributions from the discipline of Knowledge management

Again we are at the same epistemic road-block where evaluations on strategy-making are being prevented despite the excellent intellectual constructs from the Knowledge Management discipline. Originally created for the MNC audience they cannot he directly utilized because of the SME's lack of contextualizing skills and the lack of convergence management skills and the required underpinning and enabling knowledge-base.

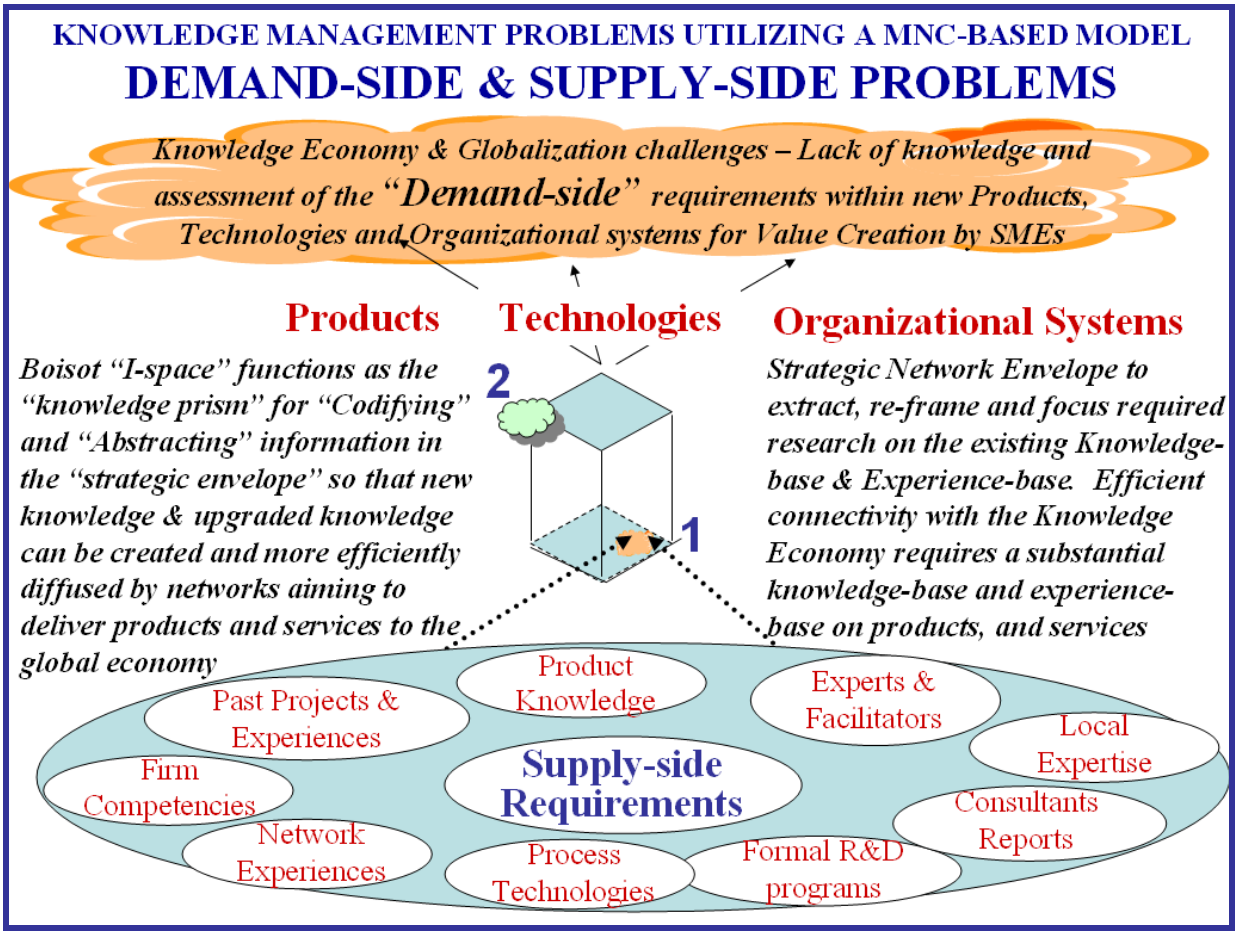


Figure 7.12 – SME barriers with evaluation of skills for the managed convergence of epistemologies

Figure 7.12 for example explains the complexity when the full portfolio of issues are prevented for SME evaluation. While the Boisot I-space is a relatively simple construct to imagine, the execution requires the concurrent availability and appreciation of two knowledge-bases – on the Supply-side and on the Demand-side. The two key locations on the Boisot-I-space are the starting point (position number 1) and the innovation launching location, which has to be established prior to any innovation dissemination program (shown as position number 2).

At the base of the diagram are illustrated the knowledge requirements on the Supply-side. This knowledge and experience are derived from prior corporate engagement in formal research, process development technologies, active involvement with Business Consultants, and expert opinions and a formal learning program.

Unless the Supply-side knowledge-base is substantial, the starting point on the Boisot I-space (represented by the Number 1) would be jeopardized in its epistemic value. This is exactly the situation facing SMEs. Their Supply-side knowledge-base is relatively meager in comparison with the typical Multi-National Corporation (MNC). Hence the value of the Boisot framework cannot be as useful to the SME as that for the MNC.

In a similar manner, on the Demand-side, the knowledge-base of the global economy is quite restricted by comparison to the MNC. The dynamics and epistemic underpinning of the typical macro-economic PESTE forces cannot be easily understood without substantial knowledge and practical experience with the macro-economic forces.

7.10 Problems preventing use of strategy-making contributions from the discipline of Knowledge management

For SME strategy-making therefore the challenges and barriers preventing managed convergence of epistemologies has prevented the cognitive and epistemic ascent routines of the Bloom Taxonomy with the "Knowledge Management" segment of the spectrum. At each of its stages, the lack of knowledge on the required convergence mechanisms prevents SME utilization of the valuable knowledge management constructs (despite then claimed successed with the original MNC focus. In Figure 7.13 the difficulties can be illustrated in the context of the two domains that characterize this convergence challenge.

On the lower right, the diagram presents the first of the two strategy – making knowledge management outcomes – with its focus on prescribing routines or approaches for necessary knowledge convergence to be obtained. From the Literature Review and the barrier assessments conducted it is clear that the Knowledge Management Movement has largely focused on this "prescriptive" domain. Most of their knowledge assets relate to programs or procedures or conceptual tasks that need to be implemented, such as:

- Communities of Practice
- Strategic Intent exercises with Mission and Vision formation
- Knowledge Repositories
- Boisot I-space derivatives etc.

Unfortunately for SMEs there is a relative shortfall in their actual implementation methodologies and in the micro-strategies within these prescriptive programs. The shortfall specifically exists at the micro-level – on how to actually do the suggested prescribed programs. Insufficient knowledge is evident in the requirements for achieving the required generative and transformative convergence through inductive, deductive, adaptive, and integrative mechanisms.

It is for this reason that the strategy-making ascent routines on the Bloom Taxonomy are being prevented for a large section of SMEs who lack this generative and transformative propensity for convergence in eGID relevant strategy-making.

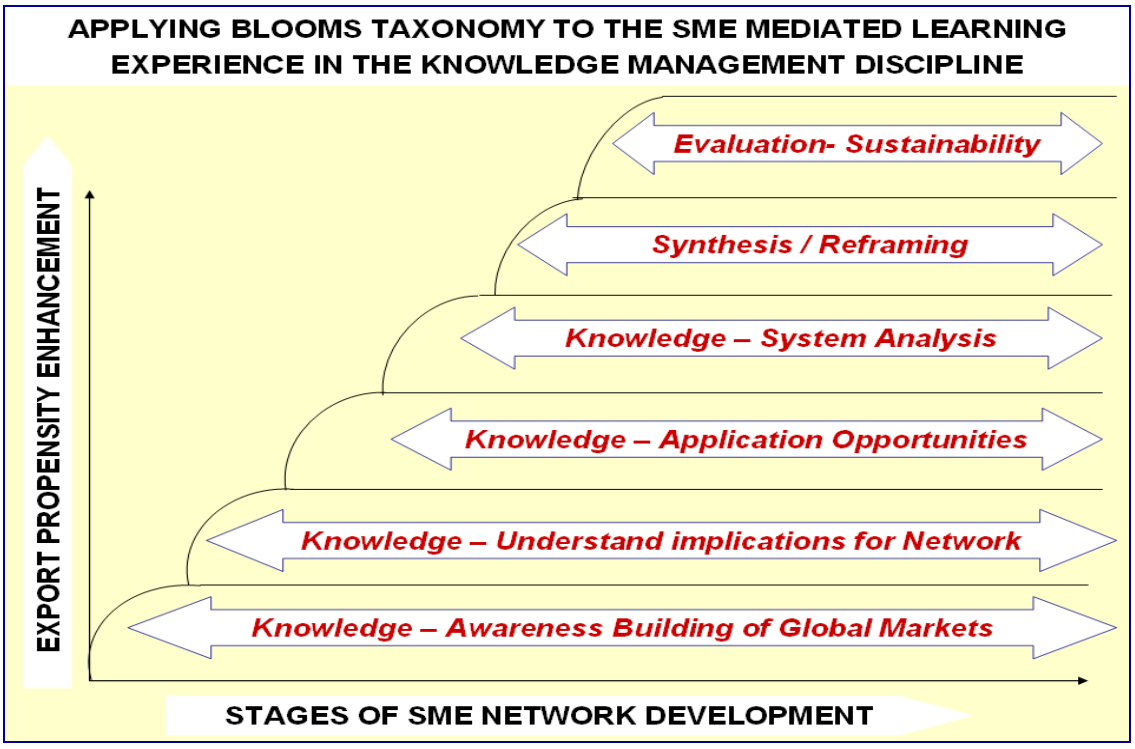


Figure 7.13 – Stages of Network Development

7.11 Chapter Summary

This Chapter focused on the problems faced by SME strategy-making in the expected use of the portion of the knowledge – spectrum that large contains the contributions from the Knowledge Management Movement. These contributions were assessed against the Bloom Taxonomy to determine if strategy-making ascent routines could deliver SME-eGID success by using this section of the spectrum.

As part of this assessment, the Chapter further confirmed the epistemic importance of the concept of convergence – in thought, word and deed for strategy-making. The conclusion however was reached that only a prescriptive or top-level set of guidelines for convergence was being made possible with the contributions from the Knowledge Management Movements portion of the spectrum.

The epistemic "how to" of managing the convergence of epistemologies was decidedly in shortfall. The multi-functional nature of the convergence phenomena has not been adequately addressed in its components of:

(i) Convergence potential – to determine the scope for utilizing the phenomena

(ii) Convergence mechanisms – to determine how inductive/ deductive/ adaptive/ integrative or generative and transformative thinking can be facilitated for strategy-making; and

(iii) Convergence outcomes – to determine how the knowledge assets of the spectrum can deliver shared epistomic identities, and where the epistomic whole can be made greater than the sum of its parts.

In Chapter 8 therefore the search to achieve the managed convergence of epistemologies continues. The focus will be on investigating the scope offered by the contribution of the Innovation Management Movement.

Finally it is noted that while the business related and legacy – based contribution from the Knowledge Management Movement provides valuable but insufficient resources, a parallel domain of knowledge from the sciences of systems Biology could offer to bridge the epistemic gap. These issues will be addressed in Chapter 9.

CHAPTER 8 BLOOM BASED INNOVATION MANAGEMENT

8.0 Introduction

This Chapter provides an assessment of the integrated methodology of the conceptual solution that applies the Bloom-Boisot-Convergence approach to the knowledge-assets made available by the domain of "Innovation Management" in order to determine its potential for SME–eGID strategy-making.

This is the last of the four Chapters that seek to determine if knowledge assets and concepts accumulated over the past 100 years at a cost exceeding $1 Trillion can be re-used and transformed from their original MNC–centric status, into the SME-relevant Post-2000 global business strategies.

Similar to the 3 earlier Chapters, the focus is on developing the Learning system offered by the Bloom Taxonomy in conjunction with the concepts from the Innovation Management Movement through the use of the Taxonomy's "Ascent Routines" for strategy-making. Also the Ascent-routine assessment is carried out in the context of the phenomena of epistemic convergence. This is because the contributions from the Innovation Management Movement forms part of the total knowledge spectrum available to SMEs. It is therefore expected that through managed convergence of epistemologies, portions the different elements within the spectrum can be integrated to create further innovations and insights for SMEs.

The conclusion however is reached that the traditional and legacy-based approaches of the Innovation Management segment and the three other "chromosomes" of the spectrum are necessary but insufficient conditions. It is argued that a dissonance exists between the availability of the total knowledge spectrum and its usability functions. It is further argued that this dissonance in availability/ usability will continue to grow and that only an active effort at epistemic convergence can help resolve the dynamics of the knowledge gap.

The Chapter concludes with the need to identify non-traditional/ non-business school related sources of contributions for learning the required managed convergence of epistemologies.

8.1 Terms and Concepts used in this Chapter

"Innovation Management" is defined as the epistemic domain or group of conceptual approaches and efforts developed by academia and industry with a focus on cognition. The aim is to assist business focus on innovation as the pathway for global business success.

Schumpeterian innovation is defined as the role and mechanisms by which the creative destruction process renews technology-enabled business innovation. It was first proposed by the renowned economist Joseph Schumpeter.

Creative destruction is defined as Schumpeter's explanation of how innovations succeed earlier systems and destroy their economic pre-eminence only to be replaced in turn by subsequent innovations.

Managed convergence of epistemologies is defined and proposed by this Research Project as the mechanism required to integrate discrete elements of knowledge.

Convergence is defined as a phenomena consisting of three segments – the potential, its mechanisms and the outcomes facilitated by convergence.

Epistemic dissonance is defined as the phenomena preventing convergence in the availability and usability of knowledge.

Innovation models are defined as the business related framing of entities and conceptual approaches into self- standing functional units.

Epistemic spectrum is defined as the aggregate of the knowledge elements contributed by academia, technology – generating industry and the movements promoting Knowledge Management and Innovation Management.

Integrated Bloom-Boisot-Convergence-Abstraction epistemology is defined as the aggregate of cognitive thinking that seeks to achieve the Ascent Routines for transformation of conventional knowledge-assets into high order thinking for strategy-making

8.2 Problems with contributions from Innovation Management Discipline

The Innovation Management Movement or domain has been extremely productive in the contribution of business models and approaches for MNC success in the global economy that focuses on the innovation pathway. The list of new models is extremely valuable and each corners different perspectives that make the "Innovation Chromosome" of the global knowledge spectrum an important and valid resource for SME consideration.

Among the list of such innovation pathway models are the use concepts such as:

(i) Multi-sided market development
(ii) Platform management and Growth Development Platforms
(iii) Product and process innovation
(iv) Disruptive innovation
(v) Frugal Innovation – bottom of the Pyramid
(vi) Open Innovation
(vii) Distributed Innovation

(viii) Management Innovation – business innovation in business models, not just product innovation

The epistemic challenge for SME strategy-making is to make use of relevant elements within these models and con-join them will matching elements of the rest of the global knowledge spectrum.

SME-strategy-making essentially needs a capacity for epistemic and dynamic mixing and matching for on-going innovation development and the creative destruction and replacements of the previous incumbants. The need for managing epistemic convergence has been argued in the earlier chapters. The need for convergence with the new Post-2000 era Innovation focused models is ever greater.

SMEs need to mechanisms of convergence to adapt, repopulate, and integrate the Innovation – modules with the aim of unifying knowledge availability and usability of the knowledge spectrum, and increasing their dynamic propensity for Post-2000 relevant SME-eGID strategies.

8.3 Epistemic Model for Problem Analysis with Knowledge Management contributions to Strategy-making Lessons

The Research Projects Questions require this segment of the Global epistemic spectrum to be subject to the epistemic ascent routines of the Bloom Taxonomy. The expectation is that convergence – facilitation type "Master – scripts" could be developed for the resolution of the epistemic dissonance in availability and useability of the global spectrum.

In this context Figure 8.1 presents the dynamic interaction been assessed by the contributions of the Innovation Movement and the Ascent Routines of the Bloom Taxonomy.

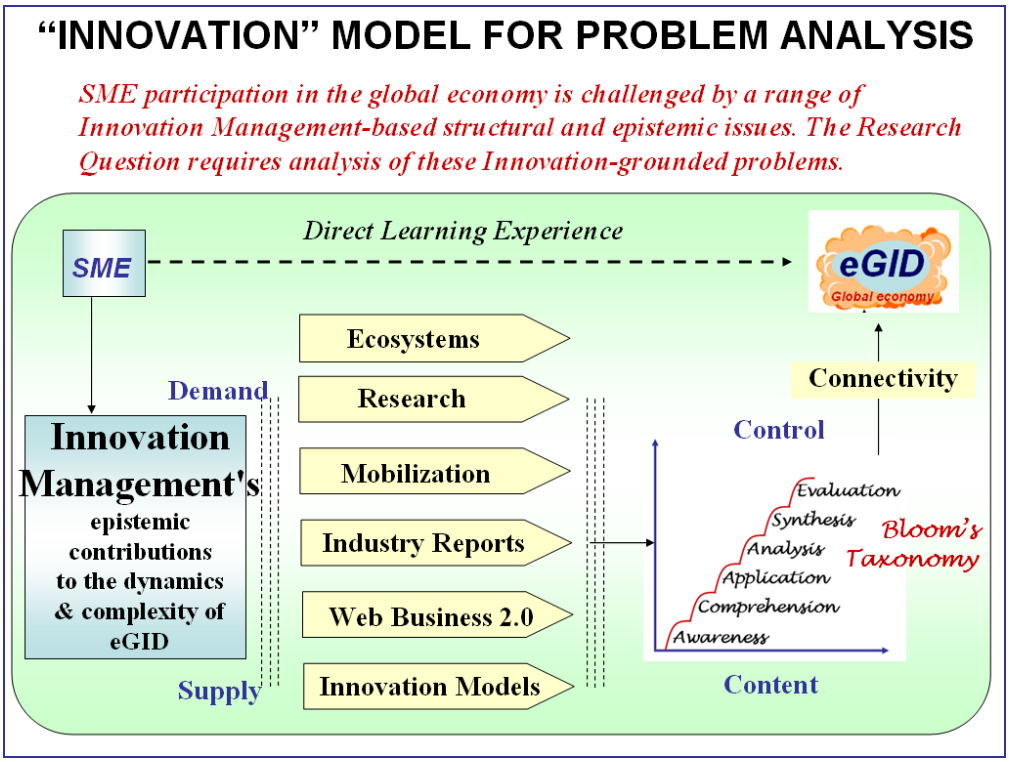


Figure 8.1 – Applying the collection of Knowledge Assets gnerated by the Innovation Management domain to achieve the cognitive Ascent Routines for strategy-making and business creation in the emerging global landscape

Figure 8.1 illustrates the purpose-designed Analytical Model that represents the manner in which "Innovation Management" gnerated kssets are offered for consideration as part of the conceptual solution being developed in this Project. The collection of assets are organized for convergence and analysis with the Blooms Taxonomy – as illustrated in the left of the diagram. The required ascent routines represented in the right of the diagram serve to illustrate the the barriers challenging SME success in the global economy. Barriers exist in converging and advancing the levels of cognition in each of the sub-sets of the Innovation Management content. The top-right of the diagram represents the phenomena of the emerging Global Industry Domain (eGID) in which these same barriers have been overcome by others. Their generation of successful ascent routines have been directly responsible for the dynamics and complexity of the global economy.

The Analytical Model also recognizes that attempts at Direct Learning Experience may be relevant for some "Born Global" type firms – but that for the rest of SME, already existing, the pathway must formally evaluate all of the epistemic options illustrated in the centre of Figure 8.1.

8.4 Awareness Problems preventing use of strategy-making contributions from the discipline of Innovation Management

In this context the same type of Awareness barriers exist as with the three other contributing groups. SME access to the daily reports, research findings and management updates on Post-2000 success need to be achieved. Boundaries need to be crossed in technologies, business and scientific disciplines to gain higher levels of awareness.

8.5 Comprehension Problems preventing use of strategy-making contributions from the discipline of Innovation Management

The Research Questions therefore require this higher level of knowledge or comprehension to the extent that we can achieve epistemic convergence (outputs) with (convergence) mechanisms that leverage (convergence) potential.

In Figure 8.2 for example the management of convergence can be explained as the management challenge of its "Push – Pull" effects on the world of digital technology resources. In the "Push" segment, SMEs need comprehensive knowledge on how elements within the Pre-2000 models can actively converge with the "Pull" elements of technology's new digitization and digital fulfillment resources. The world of cloud computing for example requires SMEs to epistemic comprehension to transform and virtualise their existing operations, as follows:

(i) Validate the existing SME model against the ones most closely related among the new range of Post-2000 Innovation

(ii) Extricate value- adding content or customer value preposition generating element from the rest of the existing SME model

(iii) Seek out the commonalities within the functional elements of both models (viz the stripped – down existing SME operation and the selected Post-2000 Innovation Management framework offering the best fit), and

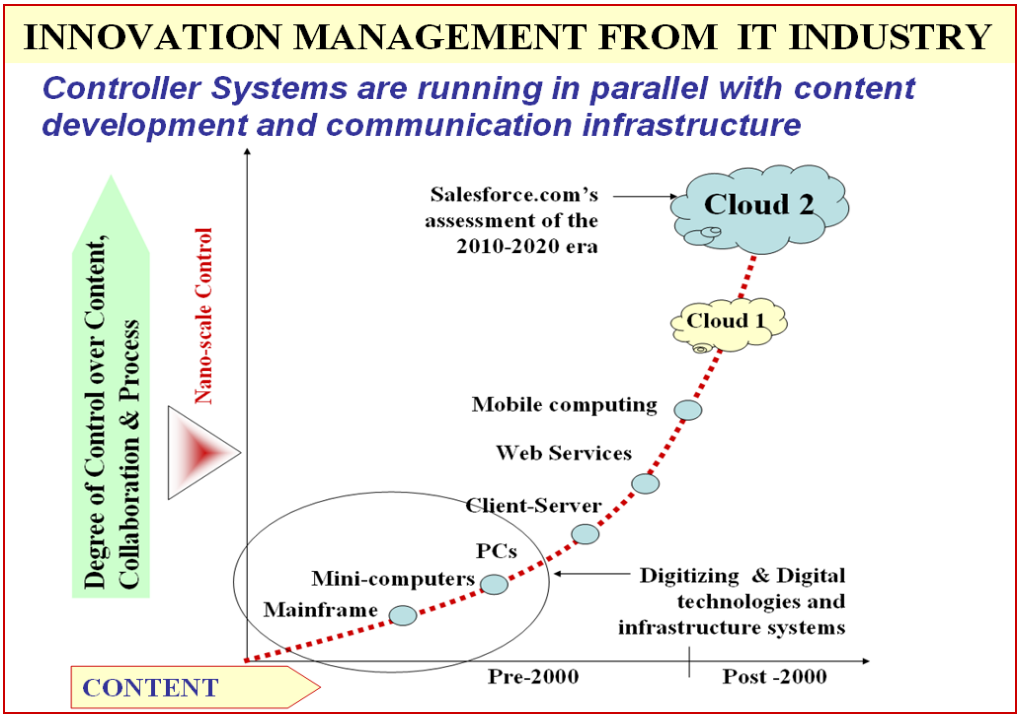
(iv) Gain new knowledge so that this convergence potential can be the basis for adaption and integration.

Figure 8.3 provides further details of the challenges for epistemic convergence for strategy-making. As indicated in the left side of the diagram, the quest for epistemic convergence can be assisted by segmenting the strategy-making challenge into two streams:

(i) Transactional – in which the new innovations would focus on improving process production, process delivery and fulfillment and customer engagement; and

(ii) Development – in which the focus would seek to establish new introduction segments or functions to the adapted Model.

SME comprehension therefore needs to extend into the possible development of business ecosystems that can be dedicated to realize the new developmental and transactional goals within the "Innovation Chromosome" strategies.



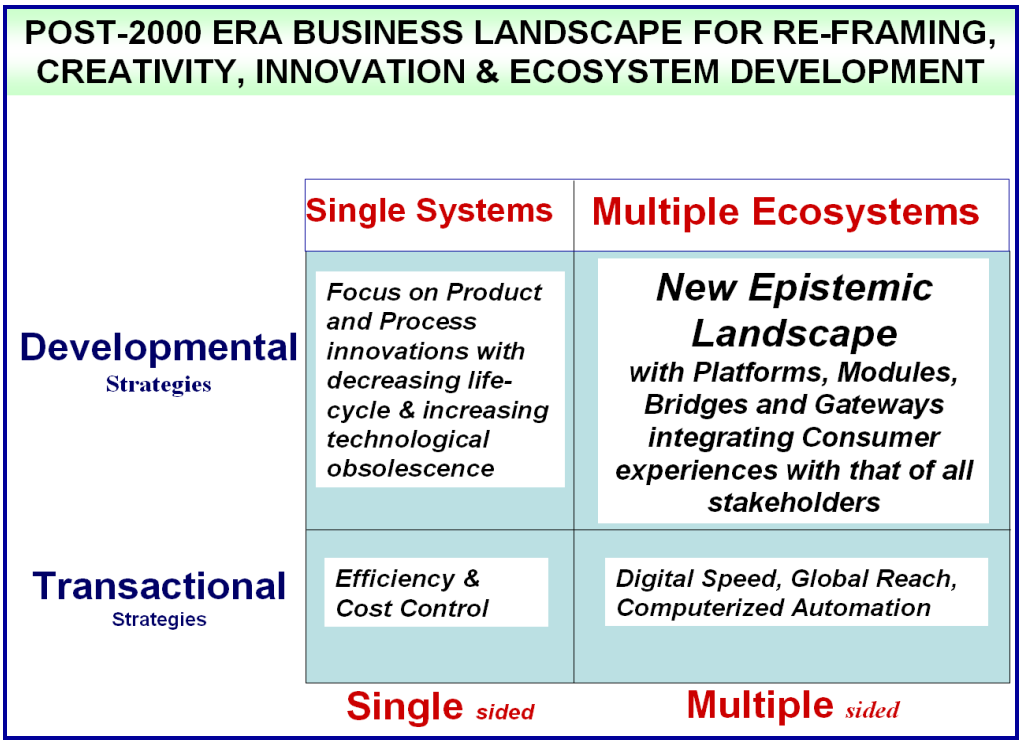


Figure 8.2 – The convergence perspective of Post-2000 IT systems

8.6 Application Problems preventing use of strategy-making contributions from the discipline of Innovation Management

The challenge for managed convergence and the required application – level ascent in the Bloom Taxonomy can be appreciated in Figure 8.4 where this Post-2000 innovation frame of Vendor Managed supply Chains are achieving increasing importance. In an updated version of the Pre-2000 "Trading House" concepts, the Vendor Managed Supply Chain (illustrated in the right of the diagram) utilizes real-time technologies to manage supply and demand in a "Turn-key" manner.

The challenge for the SME is to determine the functional convergence factors or elements that can bring together information from all entities within the business ecosystem and thereafter blend relevant segments to create the developmental and transactional objectives of the SME – eGID strategy.

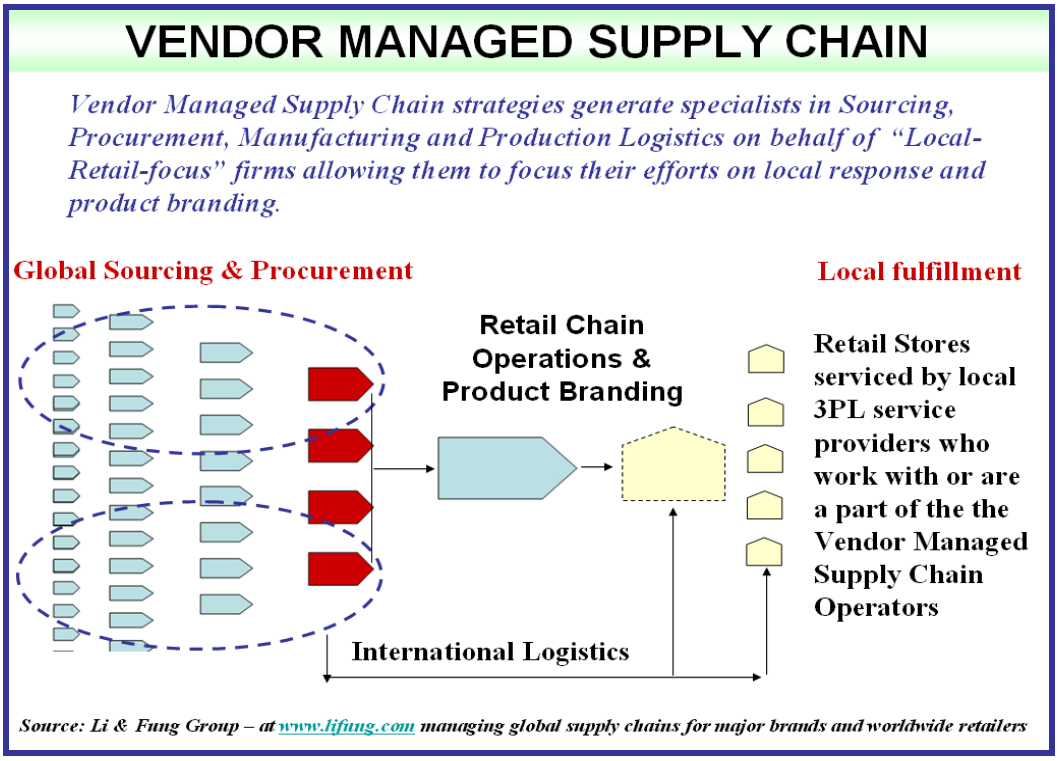


Figure 8.4 – The Convergence Driver to boost Vendor Managed Supply Chains

8.7 Analysis Problems preventing use of strategy-making contributions from the discipline of Innovation Management

For further strategy-making ascent in the Bloom Taxonomy, SME propensity to infuse convergence mechanisms and convergence outcomes will determine their success in the "Analysis" capabilities level of strategy making. Global business propensity and the analysis of

its planned strategic pathways and resource requirements can be explained in the issues of Figure 8.5.

SMEs need to develop analytical skills and propensities for decision making on the various innovation – model perspectives. As illustrated in the right of Figure 8.5, the Innovation models themselves can be considered to be a part of an innovation – spectrum or a continuum through which SMEs will need to upward – navigate their strategic assessments and engagements. It is argued that SME success levels will directly depend on the use of convergence management potential (inputs), mechanisms (processes), and outcomes (end-conditions for further advancement or adaptation).

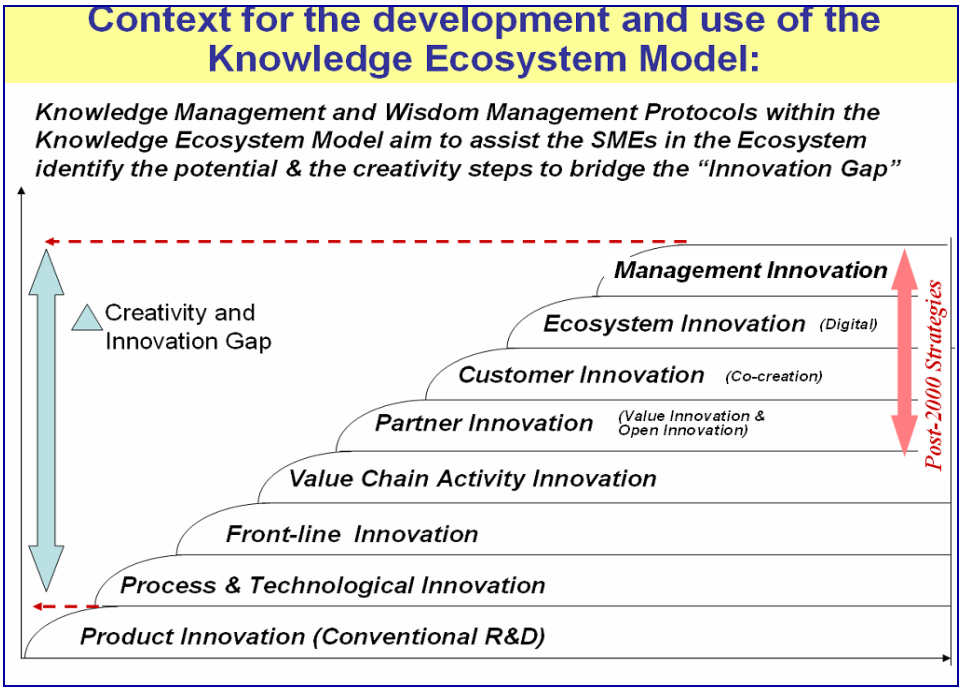


Figure 8.5 – The need for convergence functional elements to deliver global business propensity

The demands placed on strategy-making by epistemic convergence management and its ascent to the "Analysis" level requires that SMEs engage their thinking at the individual membership level as well as for the total business ecosystem. Functional elements or segments for convergence for unified action (within a SME – relevant business ecosystem) will require the individual entities to be "seeded" with a portfolio of "convergence" attachment systems.

In Figure 8.6 for example the convergence equivalents of the "primary key" within database management systems need to be assigned to each of the participants in the business ecosystem. In the case of SME-eGI multiple convergence – creating hooks or attachments would be required.

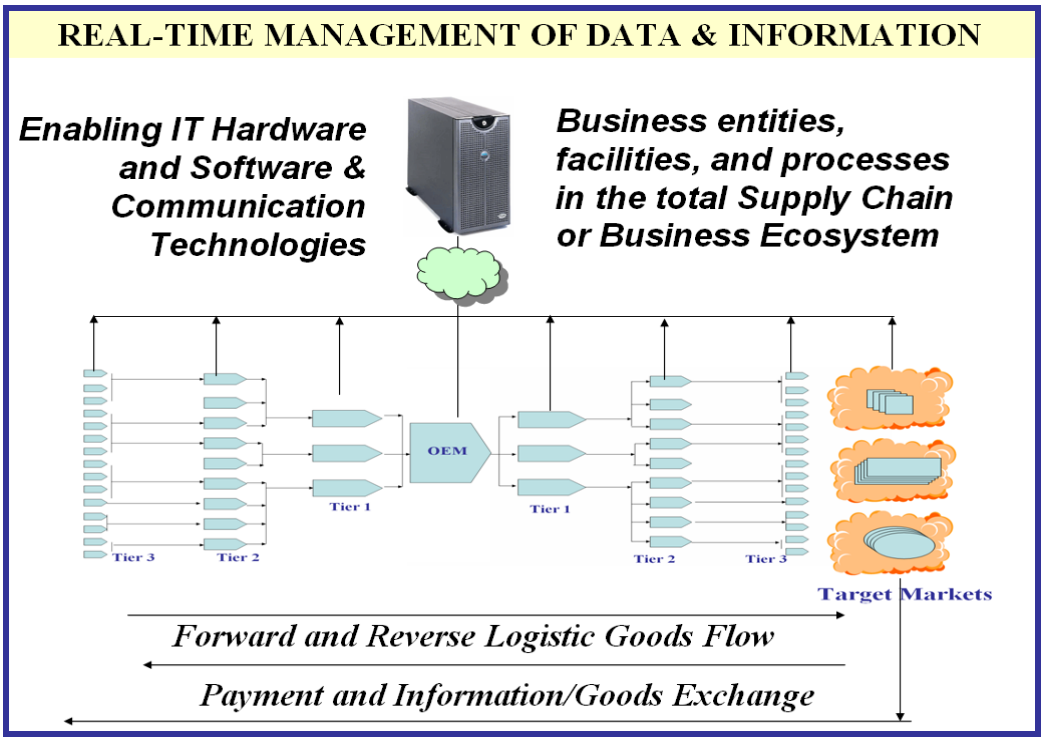


Figure 8.6 shared convergence identities for Innovation spectrum management

8.8 Synthesis Problems preventing use of strategy-making contributions from the discipline of Innovation Management

It is only through the SME capacity and propensity (willingness and mindfulness) to integrate the convergence phenomena within the types of systems (per Figure 8.6) that strategy-making can attain "synthesis" level objectives.

It is argues therefore that the phenomena of convergence management need to be progressed through the same ascent routines in the taxonomy as the strategy-making objectives and expectations.

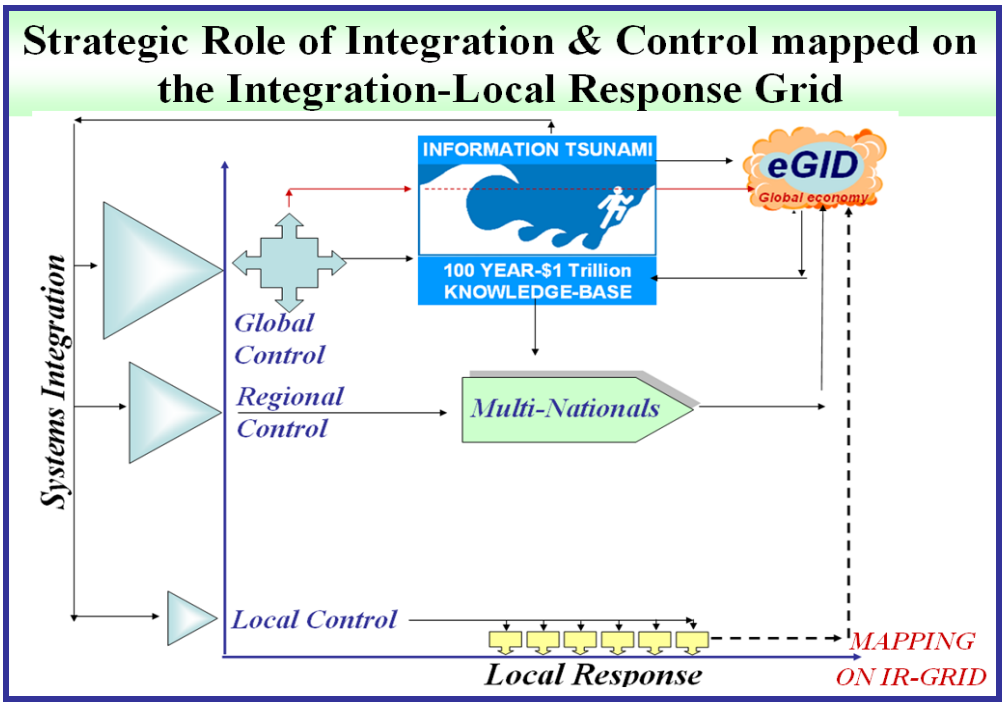


Figure 8.7 – Extending the phenomena of convergence to a general theory for strategy-making

Figure 8.7 illustrates the convergence or systems integration realities of the innovation management situation confronting SMEs. The key issue is the central role delivered by convergence innovation management control systems, as shown on the left of the diagram. It is argued that the scale of business and strategy-making success of the 3 categories of firms (ie. Global, Multi-national and SMEs) depends on the degree to which convergence and system integration can be achieved from the respective knowledge bases. At the upper left the Global integration knowledge levels are high because the global firms have greater access and resources to make sense of the demands of the global economy (eGID). Similarly "Balanced" knowledge from MNCs need to be harvested from the 100 year-$1 Trillion knowledge-base (top centre of the diagram). The efficiency and effectiveness with which the Convergence Controller system manages the demands of eGID also assists firms make sense of the "Information Tsunami", which in turn conditions the firm to better succeed with the global economy. SME firms at the base of the diagram are therefore at a structurally inferior position to access the eGID as well as the Information Tsunami without the active engagement of convergence mechanisms.

Without this convergence model the opportunity to synthesize streams of information and knowledge-bearing business concepts and models are therefore rather limited.

8.9 Strategy-making through Innovation Management

It can therefore be argued that a type of "general theory" for Convergence Management is required for strategy-making options to be evaluated at the highest epistemic level of the Bloom Taxonomy.

The Research Project consistently argues that the knowledge base of strategy-making examples and options will continue to grow and compound the barriers for SME decision-making. One of the popular options is for global strategies to focus on "Time-based Competition".

The concept requires firms to attain:

(i) First-to-market status,
(ii) First to produce capabilities
(iii) Product life cycle compaction capabilities, and
(iv) Time leadership with programs for standardization, parallel concurrent action, cross-functional teaming, and alliance building.

To the SME in a decision-making mode, such conceptual – innovation recommendations (from for example management consultants or experts) can be confusing. The risk of being tagged as a "fad" prevents its strategic value from being realise to the detriment of the SME. By contrast the application of a "general theory" of convergence could align different Model-options for decision making on the extent to which the selected option unifies existing capabilities with the best potential for success.

8.10 Innovation Management in SME strategy-making

The case for a "Convergence Model" in the form of a "General Convergence Theory" can be summarized in eGI – Information Tsunami challenges that are directly or indirectly being imposed on SME strategy-making. Valikangas and Gilbert (2005) have warned firms risk failure from three generic "Innovation Traps". New perspectives are required to manage their strategy-making portfolio of Performance, Commitment and Business Model dynamics.

Valuable as the recommendation are, their prescriptive nature lacks "how to" skills and expertise for implementation. By contrast a "general theory" of convergence could enhance the level of SME-relevance by affixing to each of their "trap-removing" recommendations an epistemic set of connectors or unifiers.

With the new epistemic equivalent of docking sites, or connectivity bridges or catalytic facilitators, SMEs can indeed capture the full value of such innovation focused thinking. This section of the chapter therefore concludes with the determination that SME strategy-making success is directly dependent on the availability and implementation of a "General Theory" of convergence that needs to be applied to the entire global epistemic spectrum, and not just the Innovation Management, chromosome equivalent.

8.12 Chapter Conclusion

This Chapter focused on the epistemic barriers from the viewpoint of SMEs being able to mobilize and adapt knowledge for Post-2000 type SME-eGID strategy-making. The first part of the Chapter addressed the last of the four categories of barriers, which adaption focused on the re-use of contributions from the discipline of Innovation Management.

The second part of the Chapter summarised these barriers and their issues for the four contributing disciplines, namely:

(i) Challenges in using traditional legacy-based knowledge from Academia
(ii) From technology – driven industry, and from the disciplines of
(iii) Knowledge Management, and
(iv) Innovation Management

Based on the summaries, the Research argues that the barriers would continue unless an epistemic exemplar type catalysing model can be developed. The knowledge elements and assets accumulated from the 100 year - $1Trillion Information Tsunami does indeed form part of a dynamically expanding spectrum or continuum. Innovative and SME-relevant strategies can only be created if a "Mix-and-Match" strategic approach can be developed to create new knowledge from the spectrum.

It is in this context that the Research argued the case for the phenomena of convergence to be the platform for the creation of an epistemic and catalysing examplar. Convergence as a phenomena can be challenging to manage because the terminology can signify its potential for convergence; its convergence creating mechanisms; and tis convergence outcomes of shared identity.

Its value as the platform for creating an epistemic and catalysing model is therefore being persued in Chapter 9. There the benefits mechanisms and the lessons of Convergence Management from Nature's DNA-epistemic system will be explored in the context of creating a model for SME-eGID strategy-making.

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CHAPTER 9 EPISTEMIC CONVERGENCE-ABSTRACTION FOR BLOOM'S LEARNING AND BIO-INSPIRED FRAMEWORK

9.0 Introduction

This Chapter focuses on creating and presenting the scientific basis for the establishment of the bio-mimicry framework as the epistemic exemplar and Conceptual Solution for the Project's 4 Research Questions. As a result, the Chapter is able to utilize the epistemic parallels or equivalents of Nature's Knowledge-Wisdom Management system. The barriers identified in Chapters 5-8 become easily manageable when Nature's convergence-abstraction mechanisms are applied to the Pre-2000 and Post-2000 stratgy-making information tsunami. Research Questions 1 and 2 are satisfied and we advance to Chapter 10 where the Cpnceptual Solution is operationalized for Questions 3 and 5.

The chapter commences with the confirmation that it is difficult for Pre-2000 and Post-2000 knowledge assets to be directly transformed into Post-2000 SME-relevant strategy-making outcomes. Chapters 5-8 confirmed this situation on the lack of an epistemic catalyst or the "third dimension" in the Boisot-I space framework for transforming knowledge assets into innovation.

In this Chapter we focus on this missing Third Dimension, as the Condition of Abstraction, which can vitalize the knowledge spectrum and transform its MNC-generated business ecosystem concepts so that they can be utilized for SME strategy-making and eGID success. We argue that through bio-mimicry and its lessons of "Abstraction" that SMEs can boost the Cognitive Ascent Routines offered by the Blooms Taxonomy and its harvesting of the 4 sources of knowledge assets (Chapters 5,6,7 & 8 respectively). Further the condition of Abstraction in conjunction with Convergence Management, the Boisot-Ispace, and its Fitness Landscape positioning can in conceptual terms deliver a total solution for SME business ecosystem success.

The Chapter therefore presents the case where an epistemic Convergence Management system needs to be developed so that the vital "third dimension" of Abstraction can be introduced into the conventional MNC-centric knowledge spectrum. It is the same mechanisms that has been instrumental in transforming the 100 years of Pre-2000 Biology. Lessons from Abstraction with Protein Complexes confirm the potential to deliver and succeed with the phenomena of emergence, convergencie, coherence, coalescence, etc and the delivery of innovations.

This Chapter seeks to develop the bio-mimicry-based lessons to boost the conventional knowledge spectrum, in the same way as disparate segments in Pre-2000 sciences have now successfully generated the Centrury of Biology This Chapter explores how bio-epistemic lessons are available for transferring its Convergence Management system to achieve Post-2000 strategy-making with the dynamic "Abstraction" metaphor of bio-mimicry and epistemic pre-conditioning with Convergence Management and Boisot-I space Fitness Landscape positioning.

On this basis, this Chapter advances to Chapter 10 for the physical building of a strategy-making model that will be grounded on this Chapter's Bio-epistemic Abstraction-Convergence Management-Boisot System.

9.1 Methodology in developing the Unit of Analysis

The Project's Research Question focus on the need to create a testable "Model" that can resolve the economic structural, and epistemic barriers confronting SME-eGID strategy-making that has no other option but to utilize the knowledge assets that have been created by, of, and for MNC-resourced entities.

Chapters 5 to 8 presented the difficulties in direct usage of the MNC-centric resources. They also identified the need for epistemic convergence and abstraction among the Pre-2000 and Post-2000 base of knowledge assets, so that they could be "Mixed and Matched and Adapted" for SME-eGI innovation.

In recognition this Chapter seeks to transform and re-direct the strategy-making challenge into a new unit of analysis with its focus on epistemic Convergence Management, Abstraction, and positioning in the Boisot I-space for Fitness Landscape positioning. In this context, the following research methodology is being utilized and as illustrated in Figure 9.1 :

(i) Establishing the common epistemic heritage that exists between DNA-genomics, gene expression, amino-acids, individual proteins, the science of Proteomics, protein complexes, and their common epistemic domain with business strategy- making

(ii) Identifying and conceptualizing the dominant convergence functional elements that have been made possible with Abstraction applied to protein complexes, which in turn have been responsible for the successful Post-2000 renaissance in Biology and which are shaping the innovation landscape of the "21st Century of Biology" concept

(iii) Presenting the case for these convergence-abstraction functional elements to be applied as a bio-mimicry metaphor and as the epistemic exemplar to catalyse and achieve a similar renaissance of Post-2000 strategy-making

(iv) Conducting fundamental proof-of-concept testing on the case for transferring the exemplar to SME strategy-making. We re-visit the knowledge assets of Chapters 5-8 and confirm that the addition of the Convergence-abstraction-bio-mataphor does indeed deliver the required cognitive ascent routines and the Biosot I-space positioning in the fitness landscape for SME strategy-making

(v) Presenting the case for the epistemic exemplar to become operationalised into a new paradigm in thinking and future "Model" construction and analysis.

The basis for the genetic-epigentic interaction sthat generate the lessons that make up the bio-mimicry metaphor are illustrated in Figure 9.1. Starting on the lower left of the diagram (Item 1)

is the collection of seemingly disparate proteins, each created by their respective disparate Protein-coding gene collection. Epigenetic factors however have been in play before these genes were expressed. In fact they have been instrumental in orchestrating the collective dynamics and grouping them together (Items 2 & 3 Centre of the diagram) for application of the infusion of Convergence-Abstraction mechanisms. Individual proteins now get transformed into Protein Complexes. However these complexes are not just a simplistic aggregation of a can of proteins. Rather they become new higher-order entitie or molecular ecosystems complete with new epistemic characteristics and with propensities for bio-epistemic interactions with a full range of other complexes, proteins, cells, etc. These are illustrate din the top right (Item 4) of the drawing. This enhanced higher order status demonstrates the power of the epigenetic factors and functional catalyzers. It is the portfolio of epigenetic catalyzers that this project seeks to emulate int eh bio-mimicry exemplar for strategy-making

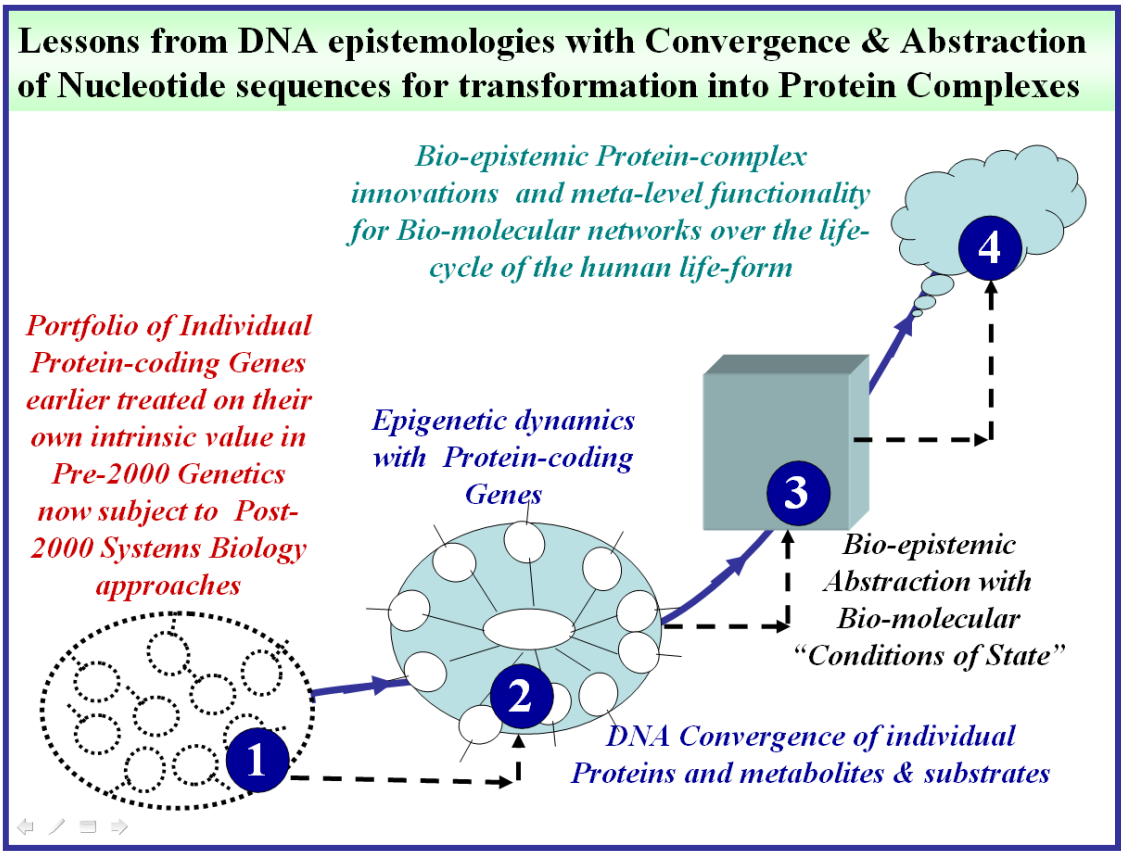


Figure 9.1 How Post-2000 Systems Biology has advanced with the combined use of Protein Complexes and Abstraction for generating "meta-levels" of integrated functions

9.2 Definition of Terms and Concepts used in this Chapter

DNA-genome – is defined in the context of the information value that is made available from the sequences and groupings of the nucleotides that constitute the DNA-molecule (ie A, G, T, C being Adenine, Guanine, Thymnie and Cytosine).

Genetics is defined as the study of 1.8% of the Human DNA molecule, which creates or expresses the epistemic conditions that allow the aggregation of coded amino-acids to form proteins

Epigenetics is defined as the study of 98% of the Human DNA molecule, which creates or expresses the epistemic control and conditions that enable the 1.8% Protein-codong Genes to become active or be curtailed

Conditions of Convergence and Abstraction are defined as the result of the Epigenetic interactions or controls exerted by the the Epigenetic segments of the DNA on the Protein-coding genes

Bio-epistemic exemplar or metaphor is defined as the comparison made between the genes and the epigenetic segments of the DNA, whichcan be directly compared with the Public-domain knowledge of strategy-making and the "abstract" controllers or Conversion catalysts that need to be embedded within the public-domain knowledge assets to create Post-2000 innovations in business strategy-making

Protein synthesis – is defined in the context of the creation of proteins from other proteins and building blocks (such as the 20 Amino-acids) as a result of the convergence that is achieved between complementary 2D and 3 Dimension shapes.

Spatio-temporal convergence – is defined as the convergence mechanism that enables building blocks to be integrated into the characterization and or formation of integrated wholes.

Human Genome Project – is defined in the context of identifying the 2D and 3D spatial-shape relationships that exist to categorise its 3.1 Billion nucleotides that make up the DNA molecule.

Protein – Coding Genes – are defined as that portion of the DNA genome that provides the epistemic code for the capture and integration of Amino Acids for their unification into proteins, based on their unique spatio-temporal characteristics.

Protein Complexes are defined as the aggregation of groups of individual proteins and bio-chemicals that together form the higher-level entities that are responsible for the richness and the innovations within the life-cyle of the human life-form. Studies in Post-2000 Systems Biology have confirmed the need for the study of individual genes and proteins to be advanced into Protein-complex level if the dynamics of the human life-form are to be better understood

Non-protein Coding genes are defined as the main (98%) portion of the DNA – molecule that contains controlling elements for managing the protein-coding processes within a range of other biological functions – with all based on their unique spatio-temporal dynamic characterization.

Functional Elements – are defined as "Active" ingredients or catalysers within the Non-Protein coding portion of the genome that utilizes its spatio-temporal characteristics for the management of development and transactional function in the human life form and all its competencies and capabilities including strategy-making.

Stem cells are presented as an example of the epistemic feedstock that can be converted into multi-functional variants based on their epistemic spatio-temporal switching.

Molecular Convergence – is defined in the context of its potential for 1 to 1 and Many to Many relationships between the molecular elements resulting from the DNA molecule.

Cellular Convergence – is defined in the context where the cells of the human life form achieve function through the spatio-temporal convergence systems.

iPSC – Induced Pluri-potent Stem Cells are presented as an example of the outcomes of Bio-epistemic convergence management, whereby spatio-temporal changes made to the DNA of stem cells cause the transformation and innovations in the human life form. iPSC Biology is presented in the context of the new Post-2000 Biology that focuses on Nature's Convergence Management system that is grounded on the epistemic spatio-temporal signatures of all of Nature's biological assets.

Bio-epistemic signatures are presented as the unique spatio-temporal characteristics of all biological feedstock, intermediates and outcomes evident at the nano, micro, macrio, or mega-system levels.

Thematic convergence elements are presented as the epistemic equivalent of genomic (biological) functional elements that are grouped for unified action to utilize create, or external functional utility for the epistemic assets.

Abstraction is defined as a Condition of State that can be achieved by the combination of factors that is made possible from their convergence. Abstraction's conditions of state catalyses the creation of a meta-level of cognition for further rounds of cognitive ascent routines

Abstraction Conditions of State are defined as the portfolio of high order competencies or capacities created in the psyche of an agent. Their psychological representations are delivered by the convergence of the individual contributions made by members of an epistemic ecosystem. Examples are the converged-aggregation of entites to create integrated systems delivering agility, convertability, identiy, mobility, reliability, visibility, unity, usability, etc.

Ascent Routine or Cognitive Ascent Routines are defined as the staged progression of learning through which higher orders of learning and knowledge are achieved. The Blloms Taxonomy offers such as staged process of cognitive Ascent Routines by recommending the progressive advancement of information from the Awarenss levels through to Comprehension, Application, Sysnthesis, and Evaluation.

Boisot I-space Abstraction is defined as the functional characteristic of ecosystems that nees to be mapped on Z-axis of Boisot I-space cube, in which the X-axis illustrates the extent of fulfillment or distribution, while the Y-axis is the extent of Codification of the knowledge assets within a knowledge-complex of assets for strategy-making

Third Dimension is defined as the collection of "conditions of state or end conditions" that form part of the Abstraction portfolio generated by the interaction of epigenetic factors on the protein coding genes. The net result is the creation of bio-epistemic entities that are biologically

characterized by factors of identity, reliability, velocity, unity, mobility, etc. These are the factors or the transforming end-states that are the subject of the bio-mimicry. The Third Dimension represents the expectation that these conditions will be embedded within the MNC-centric public domain business models for the development of disruptive technologies and disruptive innovation.

9.3 Nature's Convergence Management System

The successful renaissance of Post-2000 Biology was preceded with 100 years of building and using disparate domains of knowledge and understanding at the molecular and cellular levels. The 1953 explanation of the structure of the DNA-molecule was one of the most profound discoveries for unification of the 100 year scientific discoveries. The Human Genome Projects preliminary completion in the year 2000 revolutionized the world of the DNA molecule. Its key finding was that only 1.8% of the DNA molecule was responsible for the epistemic coding that provides the menu for the selection of amino-acids that need to be joined together to form a specific protein. Importantly also the Human Genome Project explained that the other 98% of the DNA molecule (which used to be termed as Dark DNA or Junk DNA) contained the epigenetic elements and factors that control the 1.8%. The epigenetic factors are also responsible for "convergence management" over all of the bio-chemicals, proteins, tissues, and organs and metabolites that share common segments of sequences of the DNA's language of life – the nucleotides A,G, T and C.

In this Chapter we uniquely steer away from an exclusive focus on the traditional DNA functionality relating to heridatory trails, forensic DNA finger-printing, and DNA-replication, etc., With epigenetics, attention is placed on both the individual geners as well s on the protein complexes that can be co-expressed and formed into the new unit of analysis in Systems Biology.

This Project's research therefore focuses on all of the epistemic codes (ie. both genertic and epigenetic) that are created by the sequences of the 4 A, G, T, C nucleotides – that apply to both individual proteins and their collections known as Protein Complexes. The epigenetic arrangements in particular catalyze the unique "sites and mechanisms" for connecting the Protein Complexes to other molecular sites, to cellular entities, and bio-substrates and metaoblite elements, etc. These eventually become visible elements and organs and tissues and systems that together make up the richness and innovation within the human life form.

9.3.1 Bio-epistemic Convergence and Abstraction – the new unit of exchange

The new approach presented in this Project focuses of the spatio-temporal connectivity mechanisms that originate from the DNA-molecule and its 3.1 billion nucleotides that make up the human life-form. Sequences combinations and groupings of these nucleotides A, G, T, C create unique 2D, 3D and 4D dimensional bio-systems and conditions of state. Thses conditions are required for connectivity between the Pre- and Post-DNA interaction, intermediate products, feed-stock, etc.

In several cases the eventual outcomes of these spatio-temporal abstraction-connectivity elements or conditions of state are large enough to be visible to the eye. This is one of the reasons why Pre-2000 Biology was limited to its descriptive focus on the functioning and pathologies of the various systems, (eg Digestive System, skeletal – muscular system, the Respiratory system, and the Central Nervous system, etc.). In the Post-2000 era of Systems Biology, the focus is on better understanding the epigenetic control elements and the epigenetic pre-control signals that initiate the genes for their expression of proteins. This is the meta-level of knowledge and understandingthat is characterizing Post-2000 Systems Biology and its catalysis of new knowledge in the sciences of Endocrinology, Immunology, Cardiaology, Neurobiology and the pathologies of Oncology and the new beginnings of Regenerative medicine with Stem Cell Biology, etc.

In this Chapter we therefore argue that it is the lessons of the epigenetic interactions that provide the bio-epistemic exemplar for the value-adding and transformation of generic Public-domain knowledge assets (even if they are MNC-centric) for SME-eGI strategies.

The epigenetic unit of analysis is offered as the epistemic exemplar based on the parallels that exist between Pre and Post-2000 Biology and the Domain of Business Strategy-making. For example, Business Strategy-making confronts SMEs with a near impossible challenge that impacted on Pre-2000 biology. During this same Pre-2000 period two main "PESTE" force-equivalents impacted on Biology:

(i) The increased awareness and prevalence of diseases such as cancer, hypertensions, heart failure, neuro-pathologies, etc and

(ii) The increased availability of digital electronics for the instrumentation that is able to record the nano-scale interactions that commence from the DNA – molecule – cellular interactions.

An expansive epistemic landscape of Pre-2000 knowledge issues and challenges existed in just these 2 areas alone. The creation of new strategies in Post-2000 Biology would have been impossible to navigate without the transformative strategies offered by Systems Biology and its portfolio of epigenetic factors and controls.

Epigenetics has changed the focus by extending the consideration of individual genes as well to as their expanded protein-complexes. Epigenetic considerations have catalysed the creation of new insights. Epigenetics dominant driving mechanisms have been the catalytic effects of abstraction that has been applied to pre-converged systems, in real time dynamic synchroniztion.

Applying the epigenetic bio-metaphor can catalyse new entities and meta-levels of cognitive conditons of state. The biology of the converged systems can create new ecosystems with new vistas of understanding. The expectation is that epigenetic equivalents for business strategy-making can explain mechanisms and pathwaus to mange, merge, adapt, abstract and transform the individual elements into new innovations for SME-eGI, in the same way as elements within the bio-epistemic spectrum are converged, abstracted, and transformed into new entities from the generic code of the human DNA-molecule.

The bio-mimicy seeks to emulate Nature's Convergence-Abstraction-transformation Management System, just as it continues to deliver almost on a daily basis, the successes and innovative knowledge that now charqcterize the Post-2000 Biology domain.

The common DNA-nucleotide A, G, T, C epistemic base validates the fact that all human behaviour is grounded upon the "connectivity-abstraction" elements within the epigenetic segment of DNA with other molecules, all proteins, all complexes all cells, and all tissues and organs. The new limit of exchange in Post-200 Biology is the unit of convergence, abstraction and transformation and their combined dynamics in the total life cycle of the human life.

9.3.2 Nano–scale DNA convergence-abstraction from epigenetic catalyzers

The viewpoint of its Convergence-abstraction Management system it is evident that Nature's knowledge and wisdom management results from its use of epigenetic factors or agents in parallel with the Protein-coding genes. Effectively the 2-Dimensional knowledge-spectrum of the DNA is thereby converted into a 3D or 4D convergence spectrum or convergence continuum that had no earlier existence.

For example, from the time of embryo development and conception, the genetic-epigenetic continuum's dynamics involve "spatio-temporal" connections at the nano-scale levels. The DNA in the stem cell grows to create copies of itself that are embedded within the other stem cells created or the cells that have been "differentiated" into the start of the functional groups of cells that eventually make up the heart lungs, etc. The nano-scale unit of connectivity predominant as it is at the early stages life, does however continue for the rest of the human life.

In practical terms and in the context of the Boisot I-space model, it is evident that the epigenetic interactions perform a Abstraction-type functional role. Individual generic elements are merged and transformed into new entities as a result of the "Third Dimension" or Abstraction factor, as illustrated in Figure 9.2.

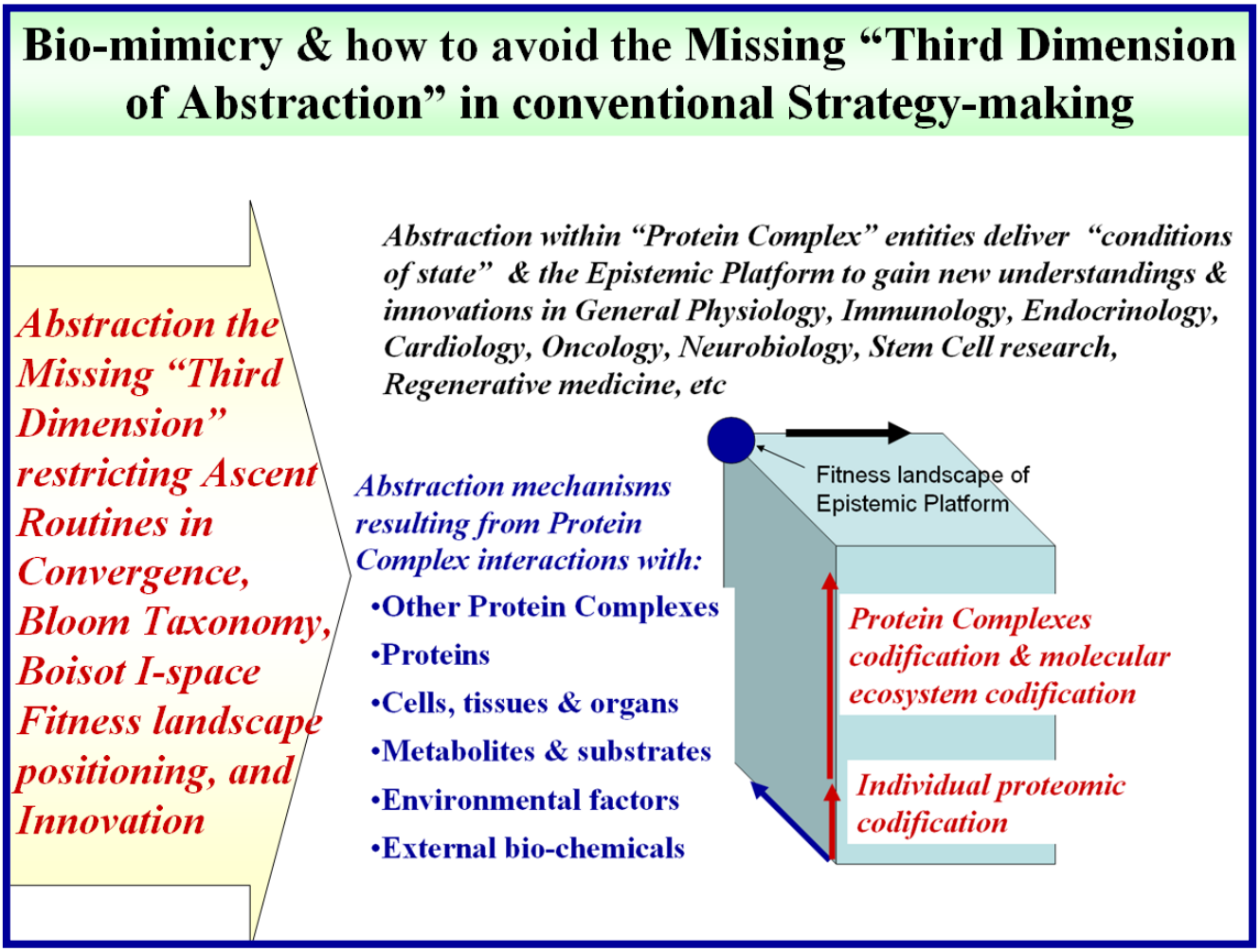


Figure 9.2 The Missing Third Dimension which transforms generic and individual proteins into higher order Protein Complexes, with a new landscape of epistemologies.

In the left of the diagram for example, epigenetic interactions help to transform all 3 axis of the Boisot I-space with a new context. The Z-axis for example infuses into the individual proteins new conditions of state that are only made possible by their merging into protein complexes, mediated by epistemic convergence. In the Y-axis of the Boisot I-space cube, it can be seen that there is an entirely new domain of codification. Initially the I-space cube's Y asis was limited to individual proteins. With the complexes, there is a further addition to the Y-axis. This is the new landscape with its own range of codified knowledge.

The new combination of the Y and Z-axis creates the new optimum position on the Fitness Landscape. From this new vantage point, and with the new entities created by convergence, new opportunities for innovation and strategy fulfilment emerge.

This is the new Fitness landscape Platform to which this Project seeks to create new Post-2000 strategies from the generic public domain MNC-centric knowledge assets.

9.3.3 Micro-scale molecular convergence

The DNA structure (confirmed by the Human Genome Project) consistes of two groups of nucleotides:

(i) Sequences that contain the epistemic spatio – temporal code to create biological structures and building blocks called proteins,
(ii) The Non-protein segment – the epigenetic segment of the DNA molecule

The protein-coding sequences, termed "Genes" – eventually build the structures, signalling chemicals, the scaffolds, and the digestive catalyzers. As such the "genes" are akin to the building blocks for strategy – making at the nano-scale level. Post-2000 biology has confirmed that such protein – coding "genes" account for less than 1.8% of the DNA-genome.

The remaining 98% contains the central elements for the 1.8% "Building – Blocks – Infrastructure" of the human life form.

At the nano-scale level therefore the connectivity dynamics is between the 98% and the 1.8% to create innovative intermediates and connections between nano-scale and molecular-scale products and intermediates.

9.3.4 Macro-scale cellular convergence for Molecular Ecosystem creation

Nature's knowledge and Wisdom Management are achieved by genomic (or neuclotide) Convergence Management systems. Epigenetic controllers dynamically extend and grow the connectivity opportunities among the protein coding genes. In the processes the phenomena of epigenetic "abstraction" occurs. Individual proteins are merged with each other under such epigenetic abstraction. Nano-scale "spatio-temporal" conditions-of–state are created. Protein complexes are created. Theme-based of functionally characterized molecual ecosystems and molecular networks are created. They include groups of molecules and groups of cells, tissues, metabolites and bio-chemical substrates. The complexes interact with other complexes and ecosystems. Their actions are responsible for the entire human file dynamic – from DNA replication, to cell division, to the stage where the stem call format is differentiated for dedicated function, etc., right to the stage of programmed cell death or apoptosis .

From an epistemic viewpoint the spreading connectivity and thematic abstraction presents and infinite landscape of scope and scale – for its epigenetic factors and lessons to be used on the "protein-coding gene" equivalents of business strategy-making resources (available in the public domain despite their original MNC-centric status).. The underlying spatio-temporal connectivity and thematic abstraction mechanisms are directly relevant to ecosystems – again an epistemic domain that is of high relevance to SME-eGI strategy-making.

9.3.5 Mage-scale systems biology under convergence

The convergence continues finally reaches the stage where its repositories of the DNA-code, form into the aggregated groups that are visible as organs, tissues, and systems. They are made from the unique DNA molecule that inhabits each of the 100 Trillion cells of the human life – form. The Bio-epistemic Convergence Management system is therefore involved in the synchronized exchange of biological signals, instructions, unifiers, aggregators and deaggregators of data, etc.

9.3.6 Bio-epistemic exemplar

The magnitude of the scale, scope, intensity, and temporal-dynamics in synchronizing 100 Trillion cells via its common spatio-temporal language of exchange without doubt offers itself as the ultimate unit of analysis for the Project's Research Questions.

Any Management system that can coordinate, control, integrate, unify, replicate, the dynamic functions over 100 trillion, members of an ecosystem must be therefore be the exemplar for epistemic lesson capture. The outcomes of the 100 Trillion ecosystem members and their production in excess of 500,000 proteins through convergence – characterised functions must therefore be studied from all three convergence viewpoints:

(i) The potential – for convergence and abstraction
(ii) The mechanisms for convergence, and
(iii) The outcomes for convergence-abstraction

At a more focused level, the unit of analysis needs to focus on how the epistemic groups of exemplar controls (within the 98% DNA elements) are controlling the epistemic frameworks and structures (utilizing the controlled 1.8% DNA protein – making elements).

9.4 Bio-epistemic Renaissance through Proteomics Convergence-Abstraction Management

From a different perspective, the Epistemic Convergence Exemplar's functions can be characterised also as the management of "genes" (1.8%), macro-genes by the 98% micro-genes to produce the innovations of the human life form. The innovations in form, functions and time within the 100 Trillion cells and all started from the single stem cell which contained the first parent DNA and its generic protein-synthesis machinery within the same originating stem cell.

9.4.1 Post-2000 systems Biology

Post-2000 Research has focused on the mechanisms of convergence between the micro-genes and the macro-genes to produce the innovations of human life. Functional genomics is the branch of Post-2000 Biology which focuses on the micro-macro "gene-innovation creating"

convergence. Transcription factors, growth factors, promoter sites, bio-markers, micro-RNAs, etc are part of the portfolio of the micro-genes controlling the building and timing of the epistemic structures that eventually characterise and control all human behaviour, including business strategy-making.

All share a common source – the DNA's spatio-temporal convergence a mechanism that expands in scale and scope from the nano to the mega level.

9.4.2 Epistemic and Thematic emergence from micro and macro-genes.

It can be argued that through the epigenetic mixing of micro genes and macro-genes, patterns of epistemic "conditions of state" and bio-epistemic complexes and entities emerge. The patterns confirm the emergence results from the addition and infusion of "abstraction" entities such as:

- Adaptavity
- Identity
- Agility
- Visibility
- Unity
- Velocity
- Locatability
- Mobility
- Connectivity
- Reliability, and
- Usability

These emergent conditions are infused or embedded within individual entities to create groups or groupings of protein complexes, including characteristics endowed on the surface of cells, tissues and organs. These emergent patterns are made visible to the complexes because of the macro- and mega-scale status of the aggregated molecular and cellular entities. Importantly the macro-observable conditions of epistemic state become the defining characteristics of the new entities. The new integrated entities emerge from the nano-scale spatio-temporal connecting arms, markers, docking sites, or reviewing stations.

The emergent conditions of epistemic state result from these nano/ micro/ marcro/ and mega-scale interactions in conjunction with the epistemic convergence that is also established by the epigenetic catalysis. They become evident in their macro-size or form with functional characterization as proteomic, molecular and cellular :

- Bridges
- Platforms
- Cycles
- Chains
- Transformers
- Catalyzers
- Markers
- Scaffolds
- Repositories and storage systems.

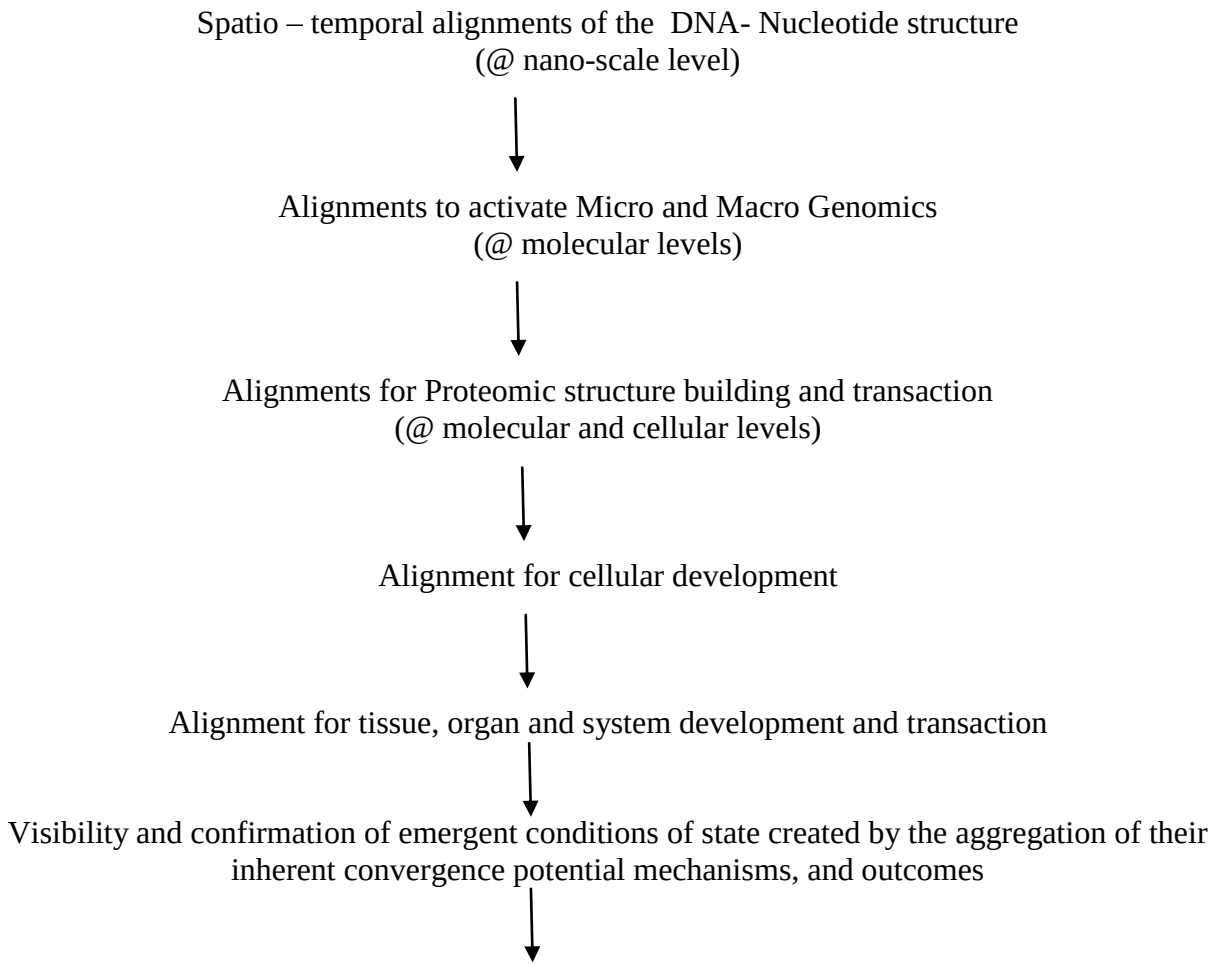
Based on Post-2000 scientific evidence it can also be argued that emergent conditions of state and the convergence management dynamics are the dominant mechanisms for all molecular, cellular, tissue – scale and organ and system behaviour.

In aggregate the emergent conditions of state literally generate an epistemic spectrum of convergence and abstraction – starting from the nano-scale spatio-temporal interactions and aggregating to meta and mega-scale behaviours. Groups or clusters of cells that constitute an organ are characterised by the visibility and identity of their connecting mechanisms and common functions. As groups, they establish agility to function under dynamic changing environments, with a velocity required for the integrity, locatabitity, and usability of the end-products, intermediates and feedstock.

9.4.3 The Emergent Exemplar to impelent Convergence-abstraction signatures.

The value of Nature's Convergence-Abstraction Management system and its super – qualified status as the Epistemic Exemplar is therefore reliant upon the methodology in which the emergent conditions-of–state are integrated into the public-domain gene equivalents of MNC-centric knowledge assets. The functional and structural utilization of the portfolio of the emergent condition of "identity, integrity, mobility, velocity, locatability, visibility, and reliability etc.," are therefore the dominant challenges.
Again Post-2000 Systems Biology outlines the Nature's Wisdom Management system applies the convergence-abstraction system. In this case its lessons focus on how the epigenetic transformational factors are applied to molecular networks and to bio-molecular ecosystems. The Protein-complexes apply their epistemic (neuclotide) signatures to other complexes and bio-entities. Their "tertiary and qauternary" signature mechanisms deliver epistemic convergence, thematic abstraction and generative transformation that results in macro-scale bio-innovation. Developmental and transactional functions of all of the 100 Trillion – bio-epistemic ecosystem are tuned to achieving these "macro-scale complex" versions of the emergent conditions of state, varying combinations in a time, scale, and location.

Each emergent condition of state is therefore manifested with an epistemic signature of convergence. The signatures are the guide, the catalyst, the unifier, etc of all bio-epistemic behaviour, involving different groups of assets of the biological ecosystem, at different time domains. In true emergent behaviour (characteristic of Complex Adaptive Systems), the following seemingly unrelated factors actually develop into the dominant mechanism of the Bio-epistemic exemplar, as follows:



9.4.4 Emergence of Bio-epistemic Convergence-Abstraction in the Boisot I-space.

In Chapters 2 to 8 the case was presented that harvesting the value of the Boisot I-space requires competencies to be developed for the management of the Z-axis representing the capacity for "Abstraction". Also it was presented that the peak of the Y-Z coordinates represented the best launching position for innovation development. Essentially the Boisot – I – Space requires the mixing and matching of Abstractions (in Z-axis) with codified knowledge (in Y-axis). At its peak Y-Z coordinate multiple innovation pathways can be created along the X-axis.

The power of the Emergent Bio Epistemic Exemplar is its convergence capacity to characterise, select, unify, differentiate, integrated substantiate and validate the codified knowledge embedded within the Macro – Genes (Y-axis). The Emergent Exemplar's conditions of state provide integrity, identity, reliability, mobility, and validity etc for the macro-genes to reach the state of readiness for further transformation and biological innovation – via developmental or transactional pathways.

9.4.5 Emergence of the Convergence-Abstraction spectrum

The emergent biological conditions of state are not just a theoretical construct. Post-2000 digital technologies in the form of X-ray diffraction, Chromatography, Mass Spectrometry, Computer Assisted Tomography and CAT and MRI scans – all attest to the presence or absence of the emergent conditions of state in either good health or in pathologies. In the context of the Boisot – I – space therefore the emergent biological conditions of state can therefore be categorized into a convergent spectrum, complete with groupings. This would be similar to the manner codified "macro-genes" are categorised into the 23 biological chromosomes that make up the DNA's 3.1 billion pairs of nucleotides.

9.5 "Third Dimensional" Functional Geonomics in the Emergence–Convergence-Abstraction Spectrum

Nature's Management system of the Emergence – Convergence-Abstraction spectrum is achieved effectively by the activities of the epigetic "Third Dimension" of bio-markers, initiators, terminators, connectors, bridges, inducers and validators, etc. The net result of the epigenetic Third Dimension is the conditions of state or the end-conditions created by the transformed Protein-coding genes. The Third Dimension are essentially the "Functional Elements" and the Tranforming and Translational Factors comprising and residing in the 98% DNA elements. Post–2000 knowledge of the Third Dimensional factors and the dynamics of the science of Functional Elements are revolutionizing and transforming Post-2000 Biology and truly contributing to the 2st century being the Century of Biology.

9.5.1 Reflecting on Bloom's Taxonomy with the Third Dimensional Exemplar

Chapters 5 to 8 confirmed that the "Ascent Routines" of the Bloom Taxonomy could not be achieved without an equivalent of the epistemic exemplar of convergence-abstraction. Business strategy making requires the epigenetic catalyst for the transformation of Pre-2000 and Post-2000 strategy making building blocks for SME-eGI success. The MNC-centric gene equivalents cannot be easily integrated and adapted to generate innovations for Post-2000 SME–eGID strategies.

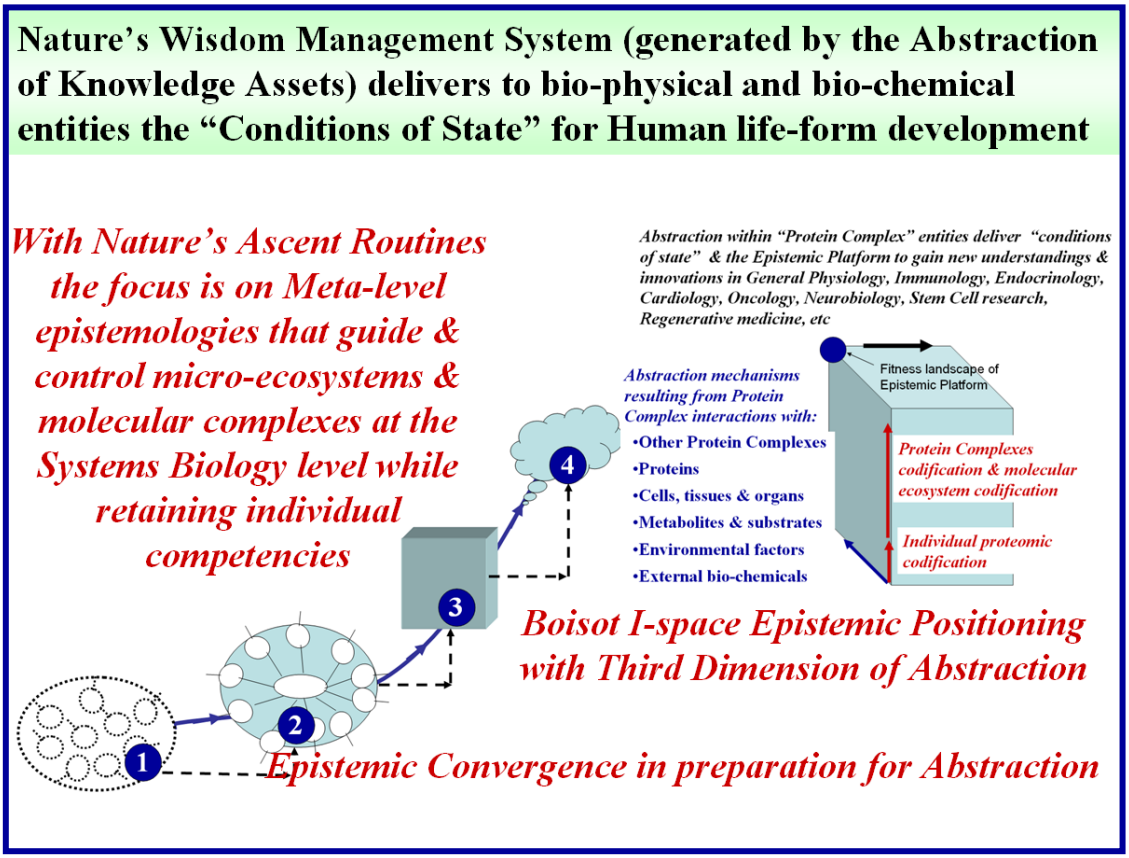


Figure 9.3 Lessons from Bio-mimicry that demonstrate how bio-convergence and abstraction create conditions of state for staged success in the fitness and innovation landscape

By contrast however, as illustrated in Figure 9.3, Nature offers lessons that demonstrate how the Emergent- Convergent-Abstraction behaviour of its epigenetic Functional Elements are catalysing new knowledge and understandings in Post-2000 Systems Biology. This renaissance can be directly attributed to the epigenetic factors that generate epistemic signatures of agility, identity, visibility, etc – in the entire molecular and cellular bio-ecosystems that make up the human life-form. .

9.5.2 Awareness of Epistemic Convergence

The very start of the Post-2000 era coincided with the preliminary completion of the Human Geomic Project. All 20,000 to 22,000 protein – coding genes were identified in the DNA molecule of the human life form. The entire biological world of scientists, researchers, students, pharmaceutical firms, clinical staff, etc all became aware of the DNA-nucleotide sequences of A, G. T, and C and their linkage to the protein synthesis pathway. Directly this mapping of A, G, T, C sequences provided the nano-scale visibility of Nature's convergence Management system, with all its downstream implications in the developmental and transactional pathways.

9.5.3 Awareness of Epistemic Convergence

With details of the Human Genome Map it became evident that only 1.8% of the DNA molecule had been accounted for and that the 98% needed to be evaluated further beyond their Pre-2000

characterization as “Dark DNA or Junk DNA”. The scientific domain of “Systems Biology”, and Non-Protein coding genes, and functional elements, and their convergence mechanism have since emerged. Global databases, and genomic maps and Congugates and Reagents of the 98% have been published to enhance the industry knowledge with higher levels of comprehension. Systems Biology’s new guidance is that a convergent approach is necessary to understand the workings of the bio-epistemic ecosystems.

9.5.4 Applications of the Third Dimension’s Convergence-Abstraction Management

Applications of Convergence Management in the post-2000’s knowledge and in the epistemic and convergence mechanisms mediate the mixing and matching of micro and macro-genes are best understood by the working of one of the functional elements groups – the micro-RND silencing elements.

The Human Genome Project has provided the sceientific basis for on-going research and explanations of how these micro-gene productions can silence and control the production of whole groups of macro-genes. The success of this Post-2000 knowledge is evident by a parallel domain of research in Micro RNA – genomics and database publications of what biological protocols are necessary for their macro-gene silencing.

Business equivalents of the Third Dimension are the key subject of this Project’s research. The bio-mimicry of the epigenetic dyncmics are rich with lessons and examples of how SME strategy-making can transform MNC-centric resources just as how the epigenetic Third Dimension transform generic Protein-coding genes and deliver out of them the richness of innovation under conditions of emergence-convergence and abstraction. In some cases the activation generates adverse pathologies, in either the required health and growth. The application of their emergence–convergence-absraction portfolio covers the multiple–single and single–multiple epistemic interacxtions. This is the new landscape for bio-mimicry – with the need to manage the Third Dimensional equivalents.

9.5.5 Analysis of the epigenetic Convergence-abstraction Management system

In true epistemic form of the “Nonaka knowledge spiral”, epigenetic information exprssed on, or impressed or embedded within “public-domain” assets (genes) by the abstraction-functional elements in turn generate rounds or cycles of further knowledge and “wisdom”. The result is the either a new innovation or a disruptive innovation involving the combined micro-gene-macro-gene innovation complexes. Analytical level knowledge of the genomic functional elements have resulted in successes with “Regenerative Medicine” and “Tissue Engineering”.

The thematic abstraction knowledge also directly interacts with equivalents of “bio-markers”. This facilitates and catalyses the attachment to other to proteins, complexes, and cells. It is these same epistemic signatures that are contained with pharmaceutical and therapeutic drugs for precision control over ailments within cells and tissues. Multi-billion dollar developments of drugs and therapeuticals are reliant upon better understanding of the the epigenetic factors and their dynamics. Essentially the Bio-makers are the indicators of their emergent – convergent

potential, availability of mechanisms, or the outcomes. Post-2000 systems Biology, Molecular Biology and Cellular Biology – are all growing on the basis of the inherent "Analytical" potential of Nature's Epistemic Examplar.

9.5.6 Synthesis of epigenetic Convergence-Abstraction Management

The scientific domain of stem cell research and Induced Pluripotency stem cells (iPSC) are further transforming Post-2000 systems Biology in its ubiquitous fashion. iPSC biology in its own right demonstrates the power of Nature's Emergence – Convergence Examplar and its reliance on the spatio-temporal nano-scale connectivity mechanisms.

By altering just four of these nano-scale molecular signatures within the nucleus of an adult (dedicated functioning cell) can be completely re-programmed and transformed into an iPSC. Essentially by altering the nano-scale geometry of the DNA – molecules, different types of cells can be created to deliver their different functionalities. This "synthesizing" of Post-2000 knowledge in systems Biology is transforming the world of health care and medication, with great potential for iPSC generated solutions to problems with cancer, alziemers, and other diseases.

The syntherizing of new product – innovations from changed nano-scale geometry is also extending into generating stem cells from abundantly available sources such as skin cells and blood cells. Once they are re-programmed to iPSC status, they can then be nano-scale re-switched to other molecular signatures for their new cells' functioning.

9.5.7 Evaluation of Nature's Convergence-Abstraction Management Systems

The new scientific domain of 4P Medicine is a Post-2000 knowledge aggregated outcome that holds great promise for the new century, by using the Emergence – Convergence Markers for:

- Predicting the risks to specific pathologies
- Preventing them from occurring, by
- Personalizing the medication and seeking active
- Participation by the patient.

Again its potential value is grounded upon the knowledge and application of the emergence convergence epistemic signatures.

9.5.8 Convergence-Abstraction Management – the Exemplar's epistemic signatures

It is argued therefore that emergent – convergent epistemic signatures are indeed the dominant mechanism for Nature's management of its 100 Trillion ecosystem membership. Epistemic signatures are dedicated for each of the emergent conditions of state and the Emergence –

Convergence spectrum makes active use of its different elements to mix and match building blocks and in turn embedded within their the conditional states of identity, reliability, integrating mobility, velocity and usability etc.

9.6 Bio-mimicry and Exemplar transfer for strategy-making

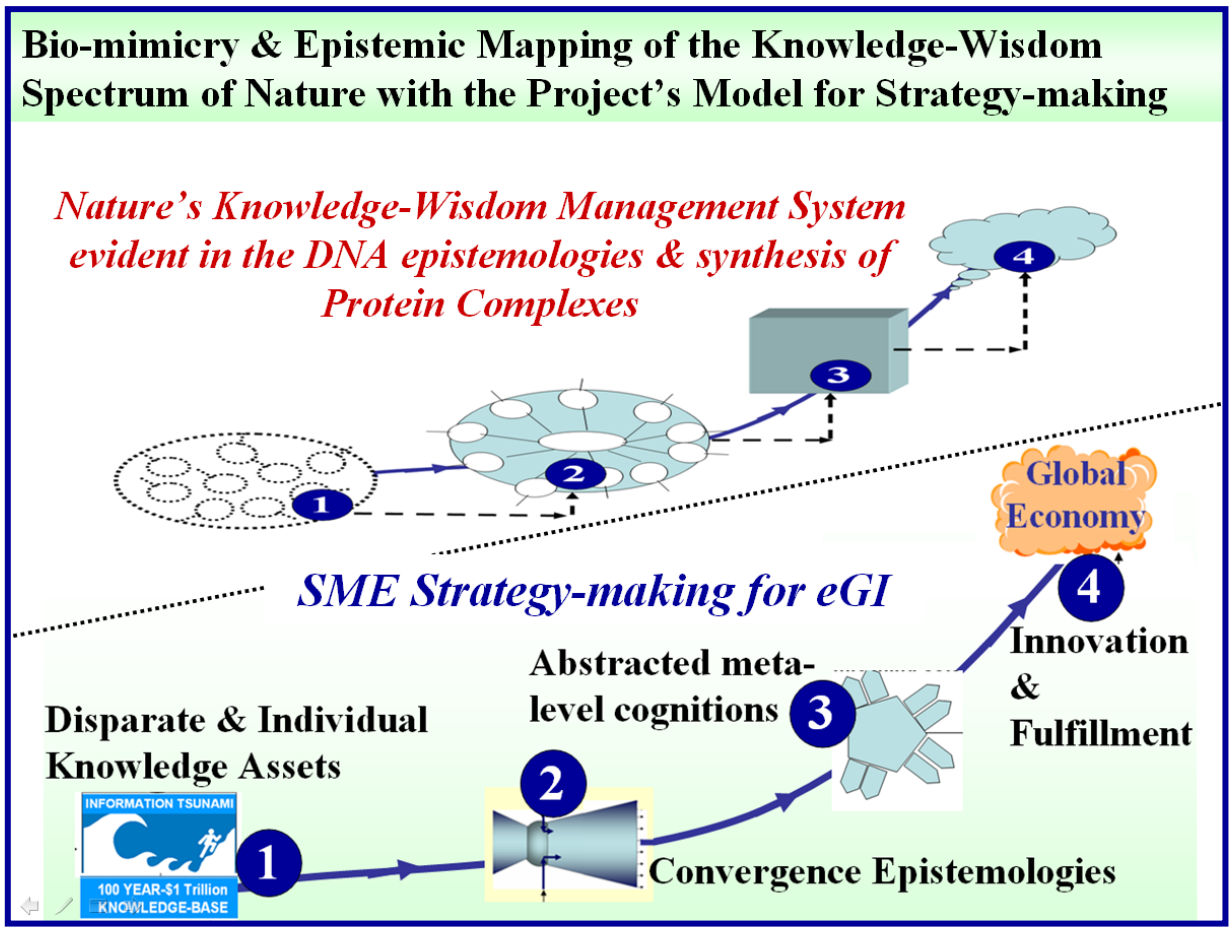


Figure 9.4 Bio-epistemic parallels between Nature and Business strategy-making with parallel cognitive ascent routines

The case is presented that three over-riding issues offer the opportunity to transfer the Emergent – Convergent Exemplar from its 100 Trillion bio-epistemic ecosystem to the 100-year $1 Trillion strategy-making knowledge base – Information Tsunami.

(i) Lessons from the common epistemic heritage of all human biological behaviour which is grounded in progressive and successive "builds" of the DNA – Nucleotide nano-scale geometry in space and time (convergence signatures)

(ii) Lessons from the relative ease with which Post-2000 systems Biology is achieving the Ascent Routines with the Bloom Taxonomy that enables Pre-2000 Biology to be value – added with Post-2000 findings for the on-going spiral of

new knowledge and innovations taking place in multiple streams of the bio-medical industry, and

(iii) Lessons from the portfolio of Emergent–Convergent signatures that resolves the "Abstraction" barriers in the Boisot I-space.

Figure 9.4 illustrates the epistemic position of Pre- and Post-2000 Systems Biology and the dynamics of the portfolio of "Convergent-Abstraction signatures" generated from the epigenetic 98% segment of the DNA-molecule (represented in the upper section of the diagram). The lower section of Figure 9.6 explains how the addition of epigenetic equivelents of the conditions of state (e. with their dominant characteristics of agility, mobility, reliability, integrity, etc,) can advance the strategic pathway to the global landscape. The methodology of embedding, infusing, integrating, and admixing thse epigenetic equivalents will be critical to the degree to which these epigenetic factors make inductive and deductive reasoning for the synthesis of new knowledge and innovation.

9.6.1 Importing the Thematic signature of the Convergence-abstraction Exemplar

It can therefore be argued that the nano-scale epigenetic signatures of the Third Dimension and their emergent conditions of state need to be organised into thematic groups. This in turn catalyses the epistemic mixing and matching to advance knowledge to achieve the required Ascent Routines and reach the optimum launch point of the (Y, Z) peak coordinate in the Boisot I-space.

The potential to transfer the lessons of the Emergent – Convergent Exemplar from Post-2000 Biology to Post-2000 strategy-making is compelling. As illustrated in Figure 9.3, the Emergent – Convergent Management system catalyzes the Abstraction functions and progressively builds the Boisot epistemic position by admixing and embedding the thematically grouped emergent conditions of state with codified knowledge.

The "Transferability" potential of this thematic portfolio of abstraction elements (of agility, identity, integrity, reliability, visibility, usability, locatability, promixity, etc) to multiple disciplines in Post-2000 Biology is the foundation for Bio-mimicry. The thematic portfolio of emergent – convergent signatures can be transferred to the Business strategy – making domain of the Boisot – I – space (illustrated on the right of the Figure 9.3)

The Bio-mimicry's transfer will directly resolve the "Abstraction" barriers that are preventing the transformation of Pre-2000 strategy-making knowledge into Post-2000 SME-eGID innovations. Similarly the Bio-mimicry transfer of the epistemic/ thematic signatures will catalyse SME capacity to navigate the Ascent Routines of the Bloom Taxonomy.

9.6.2 third Dimension with Convergence-Abstraction Dynamics

The Bio-mimicry transfer of the emergent – convergent epistemic signature includes the lessons from the "Convergent Management System" that functions as the invisible hand that is currently creating the success of the 21st Century of Biology. Business strategy-making needs to import the systems management of:

(i) Building the portfolio of thematic signatures

(ii) Developing protocols and approaches for embedding the signatures and catalysing the composites of new knowledge

(iii) Characterizing the functions of creating, checking, selecting, modifying, validating, controlling, silencing, replacing, modulating, duplicating, replicating, etc elements or sub-modules in the existing epistemic feedstock for the generation of new Post-2000 relevant knowledge

(iv) Adopting a whole of spectrum and whole of life cycle approach to the new – knowledge – innovation development challenges, and

(v) Interacting the process so that the innovation options can be progressively evaluated and improved upon.

9.6.3 Applying Exemplar to Business strategy–making

The lessons from Post-2000 Biology's exposure of the catalysing and innovating potential (of its Biological Functional Elements) can therefore be applied to Post-2000 SME eGID strategy – making. The "epigenetic" convergence-abstraction catalysts within the Bio-mimicry model requires that the epistemic equivalents of the Functional Elements be embedded within to infuse, characterize, and dynamically enhance the codifed/ building blocks of Business strategy–making.

The MNC-centric resources become transformed into integrated chains and platforms and or launching pads or resource systems with dominant purposes of delivering Client Value Propositions (CVPs). The dominant features of reliability, integrity, mobility, etc in turn can deliver sub-benefits of value to clients such as convenience, ease of use, etc. These are the very same epigenetic functions used by nature to create innovation from generic building blocks from among the 1.8%DNA or protein-coding genes.

The catalysing and innovation enhancing impacts of the mixing and matching are then expected to provide SMEs with the new resource base of strategies for the Post – 2000 global landscape.

9.7 Conceptual Solution Ascent Routines with Convergence-Abstraction Exemplar

The underpinning knowledge base from which all epistemic and biological behaviours are generated is the DNA–nucleotide nano-scale signatures of space and time, and their resulting deployment and utilization of its genomic-bassed convergence-abstraction mechanisms. All biological behaviour progressively expands from the nano-scale signature level until they become more evident and discernable at the meta and mega levels. At this stage the aggregates of the DNA epistemic behaviours (that are mediated by convergence mechanisms) are manifested as emergent conditions of state. Originally conceived as phenomena, Post-2000 systems Biology has confirmed that the emergent–convergent-abstraction states of agility, identity, integrity, reliability, visibility, mobility, etc are indeed the thematic groupings created by and created for the ongoing DNA – epistemic aggregates, until they reach convergent outcomes that satisfy the original cell for their aggregations.

Figure 9.5 for example illustrates how the convergence-abstraction concepts and conditions of state (Item 1 top left of diagram) can be used to achieve epistemic renaissance with all available information resources and knowledge assets (Item 2 -lower left).

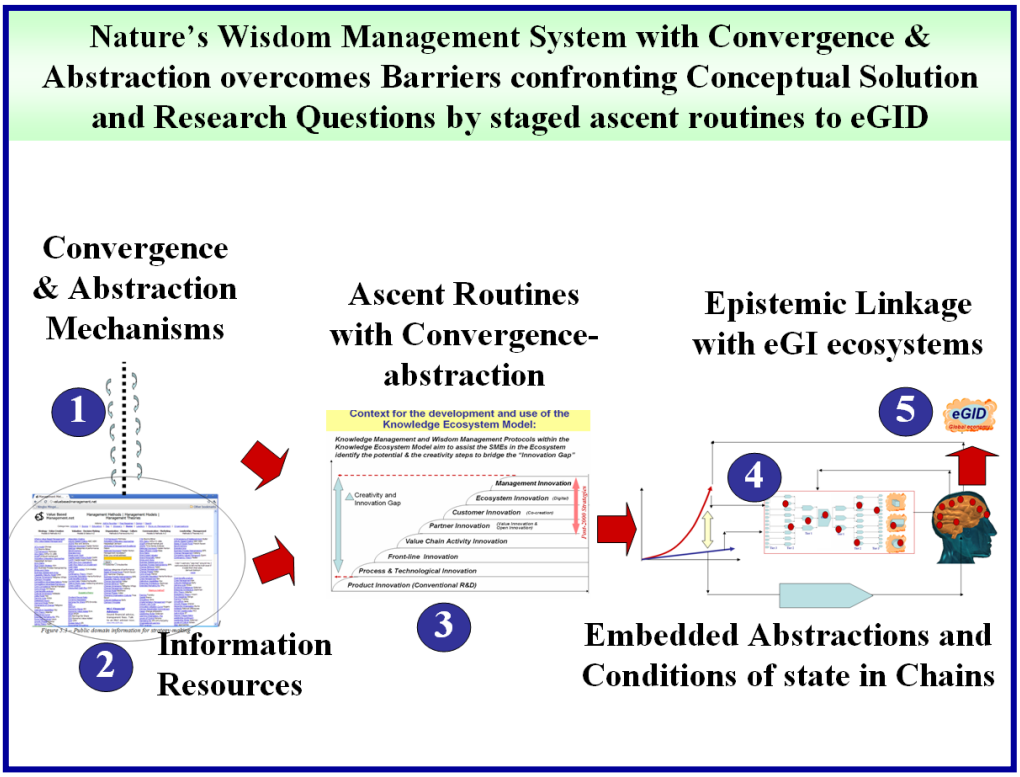


Figure 9.5 Applying Nature's Convergence and Abstraction to overcome barriers to Conceptual Solution

The Bloom-Boisot Ascent Routines can be more easily manoeuvered by the infusion/ embedding/ profusion/ enhancement/ transformation with the "conditions of state" of convergence and abstraction, as illustrated as Items 3 and 4. Generic-type strategy-making

building blocks and resources become transformed into functional chains (richly endowed with the functional characteristics of Visibility, Integrity, Identify, Mobility, etc.).

The use of the epistemic Exemplar generated from this Project's adoption of the Bio-mimicry lessons, offers these same thematic Functional Elements to deliver the required renaissance for Post-2000 Business strategy-making. The ultimate goal of participating in eGI (Item 5- top right) becomes more achievable with the transformation of the portfolio of Epistemic – Emergent – Convergent correlates of the Functional Elements of the bio-epistemic DNA-epigenetic genome. It is powerful enough to be applied to the epistemic behaviour of business strategy making. This claim is made on the basis of its successes in managing the 100 Trillion cells that make up the biological ecosystem of the human life form and its dynamic management of the Proteomic interactions in the developmental phases of human life and all of its whole of life transactions.

The Bio-mimicry and its Exemplar dynamics effectively positions the SME knowledge base at the most advantageous position for innovative generation and transformative thinking. In a single step, SME strategy-making can utilize the innovation building protocols, platforms and pathways of both the Boisot I–space, as well as the Bloom Taxonomy.

This justifies a new framework for embedding the Third Dimensional equivalents into the MNC-centric knowledge base of the 100-year - $1 Trillion Tsunami – per Figure 9.6.

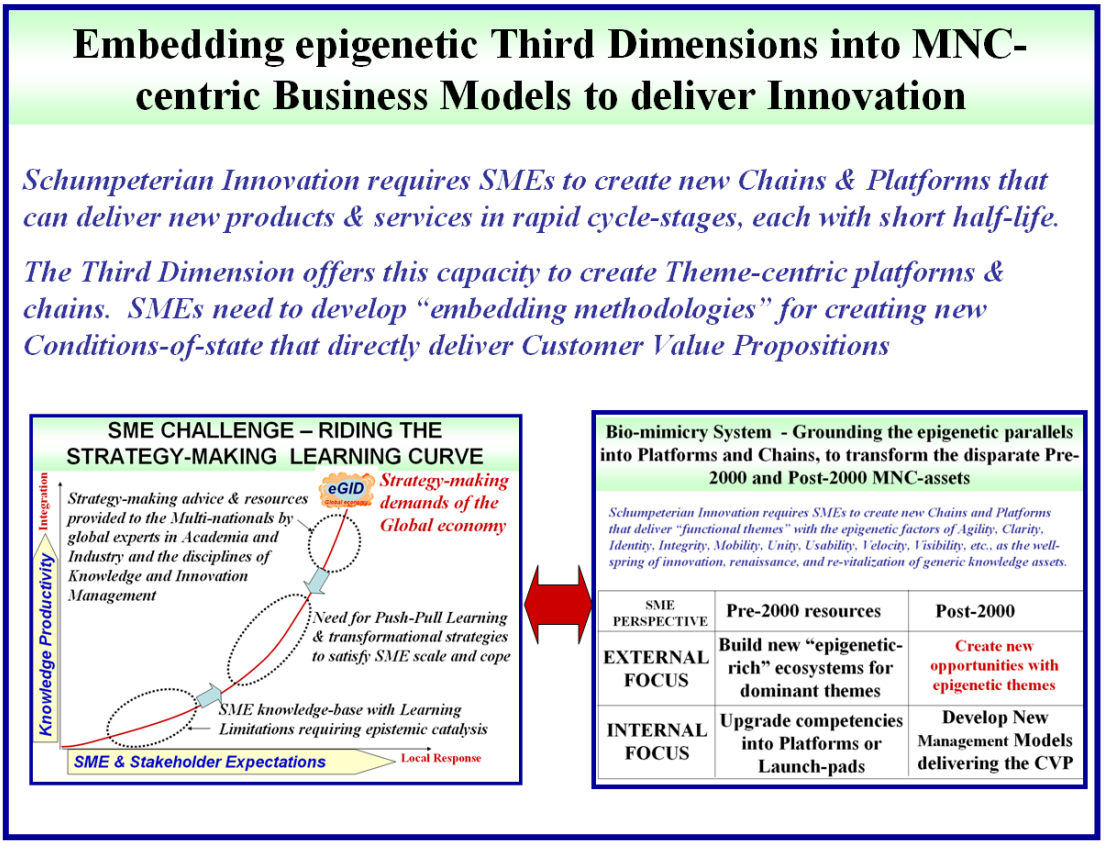


Figure 9.6 – Framework for embedding the epigenetic Third Dimension into MNC-centric resources for Schumpeterian Innovation

The Human Genome Project and its on-going research offer powerful lessons to use bio-epistemic equivalents of Nature's epigenetic controls and transforming potential for constructive anddestructive innovation. The issues to achieve this are illustrated in Figure 9.6.On the left of the diagram is theLearning Curve that SMEs need to navigate to attain SME-eGI success. A Push-pull effect can be achieved by "reframing" the competencies of SMEs (lower left figure) in the context of their capacity to deliver identify, reliability, visibility, velocity, mobility, etc. This embedding allows the SMEs to boost the Customer Value Proposition potential of their existing competencies – with an upgraded push effect. In the upper section of the same diagram, we can see the Third Dimension's pull effect. Again it requires "reframing" – in this case- the reframing of the eGI landscape and MNC-resources. The context remains of their fulfilment of the Third Dimensional states and their linkage to Customer Value Proposition delivery. The box on the right of the diagram is a Grid that enables SMES to systematically organize their thinking in both the push (internal) and push (external) embedding for innovation capture.

9.8 Summary of the Proposed Conceptual Solutions through the adoption of Bloom's Knowledge Learning Framework

The application / embedding/ profusion / infusion of the Convergence-abstraction conditions of state offers themost direct route to achieving the ascent routines of the Bloom-Boisot criteria set up for the Conceptual Solution. The application of these conditions to the Knowledge Spectrum similarly transforms the spectrum into a 3 dimensional and 4 dimensional ladder that even on the surface can boost the value of the MNC-centric reources for SME strategy-making In this section we confirm how the barriers identified in Chapters 5-8 can be overcome and how SME strategy-making can dynamically utilise the continuing contribution from:

(i) Theoretical Models for Business Strategies
(ii) Technology driven industry strategy,
(iii) Knowledge Management
(iv) Innovation Management

The summaries of the resultingremoval of the barriers are now presented in a grid type framework.

9.8.1 Awareness- Resolution-summary of Problems with all four groups of contributions to traditional disciplines

The embedding of the Third Dimension of Convergence-Abstraction as the frame in which MNC-centric reources are considered provides purpose and linkage to higher order thinking. This is a psychological state of mind that is actively engaged by SMEs in their daily business operations. Hence the Third Dimensional linkage is expected to boost the uptake of MNC-centric resources not only in each of the 4 contributing domains but alos in each of the Ascent Routines of the Blooms Taxonomy. The following tables provide confirmation of this situation created by the application of the Third Dimension.

AWARENESS - Epistemic Problems & Challenges	*Academia Barriers*	*Industry Barriers*	*Knowledge Barriers*	*Innovation Barriers*
Access to the issues – business models, and enabling factors	√	√	√	√
Awareness of the opportunities and threats	√	√	√	√
Component issues for the whole picture	√	√	√	√
Good recall of the issues	√	√	√	√
Aware of the scope for use in the problems under consideration	√	√	√	√
Aware of the systems and sub-systems requiring inclusion or development	√	√	√	√
Gaining insights	√	√	√	√
Access to the different levels of knowledge and information	√	√	√	√
Availability to the information on an on-going basis	√	√	√	√
Clarification problems	√	√	√	√
Tacit knowledge hidden	√	√	√	√
Explicit knowledge limitations	√	√	√	√
Combinations with experiential knowledge	√	√	√	√
Clarification problems	√	√	√	√
Tacit knowledge hidden	√	√	√	√
Explicit knowledge limitations	√	√	√	√
Combinations with experiential knowledge	√	√	√	√

9.8.2 Comprehension- Resolution-summary of Problems with all the four contributing groups to the traditional disciplines

The admixing and infusion of conditions of state (ie the Third Dimension) such as "Agility, Clarity, Identity, Integrity,Reliability, Usability, Visibility, etc." into the MNC-centric models transform them into easily understood "chaiins or platforms" delivering reliability, integrity, etc. The ascent routines are more easily managed with progressive advancement once the chain or platform's domoinant purpose or design is affixed by the bio-epigenetic equivalents.

COMPREHENSION - Epistemic Problems & Challenges	*Academia Barriers*	*Industry Barriers*	*Knowledge Barriers*	*Innovation Barriers*
Total viewpoint	√	√	√	√
Functional elements linked to transactions, development, resources, etc	√	√	√	√
Life cycle staging of the concepts and frameworks and approaches	√	√	√	√
Key Performance Indicators	√	√	√	√
Key epistemic determinants	√	√	√	√
Epistemic differentiation of concepts	√	√	√	√
Rigor and relevance to the strategy-making context	√	√	√	√
Development of models	√	√	√	√
Trend spotting	√	√	√	√
Pattern recognition	√	√	√	√
Diffusion – rate	√	√	√	√
Speed	√	√	√	√
Uptake rate	√	√	√	√
Infrastructure for the Bloom stage	√	√	√	√
Adaptivity	√	√	√	√
Deduction	√	√	√	√
Inductive thinking				

	√	√	√	√
Absorptive capacity	√	√	√	√
Able to take a total perspective and work down to details	√	√	√	√
Summarizing issues	√	√	√	√
Translating it for communication	√	√	√	√
Stages of development	√	√	√	√
Grounding and underpinning as platforms for future advancement	√	√	√	√
Reframing issues	√	√	√	√

9.8.3 Application- Resolution-summary of Problems with traditional disciplines:

The availability and application of the third dimension transforms and elevates the thinking of SMEs beyond their product-centric thinking. Individual elements become the logical parts of a functional ecosystem. The new membership in turn leads to higher order thinlking of the possibilities of applying their transformed product-idea into new landscapes for strategy-making and new product and new process development.

APPLICATION - Epistemic Problems & Challenges	*Academia Barriers*	*Industry Barriers*	*Knowledge Barriers*	*Innovation Barriers*
Making representations of the 100 years of academic thought and industry development and their connectivity with the strategy making challenges	√	√	√	√
Creating cognitive and epistemic hierarchies	√	√	√	√
Maintain epistemic integrity	√	√	√	√
Imagining the future	√	√	√	√
Recalling the lessons of the past	√	√	√	√
Transience – the weakening or loss of memory of the key issues involved	√	√	√	√

Transforming concepts into immediate strategy-making considerations	√	√	√	√
Application of the business models, strategies, frameworks and innovative thinking	√	√	√	√
Using the models and frameworks in real time situations	√	√	√	√
Cognitive representation of concepts and approaches	√	√	√	√
Adaptation	√	√	√	√
Modification of elements without jeopardizing integrity	√	√	√	√
Re-framing	√	√	√	√
Recruitment and mobilization of stakeholders in applications that extend beyond the individual SME	√	√	√	√
Metaphors, similes and epistemic catalyzers	√	√	√	√
Determining issues of relevance	√	√	√	√
Real-life application of ideas and concepts	√	√	√	√
Converting abstract and theoretical issues into practical value	√	√	√	√
Identifying the metaphoric links	√	√	√	√
Achieving unity of purpose	√	√	√	√
Consolidation with experiential knowledge	√	√	√	√

9.8.4 Analysis - Resolution-summary of Problems with all the four groups of contributions to traditional disciplines:

The Third Dimension of Convergence-Abstraction provides SMEs with a tool or analytical framework that can be directly applied to achieve the Ascent Routines of the Bloom-Boisot positioning. The key issue is that the application of the Third Dimension assures the SMEs of a direct linkage tot hedelivery and fulfillment of Customer Calue Propositions. Hence investments made by SMEs in the use of the Third Dimension are better assured of good reception and successful implementation.

ANALYSIS- Epistemic Problems & Challenges	*Academia Barriers*	*Industry Barriers*	*Knowledge Barriers*	*Innovation Barriers*
Transference of the situation to the SME context – getting into the cognitive landscape	√	√	√	√
Seeing structures beyond the observable manifestations	√	√	√	√
Effectiveness of models, concepts, frameworks	√	√	√	√
Levels of Risk	√	√	√	√
Causal mechanisms – disruptive and integrative	√	√	√	√
Cognitive differentiation of situation	√	√	√	√
Situational analysis and assessment	√	√	√	√
Achieving conclusions	√	√	√	√
Pattern recognition	√	√	√	√
Limitations and issues at risk	√	√	√	√
Critical control points	√	√	√	√
Epistemic Underpinnings	√	√	√	√
Pathways and mechanisms at work	√	√	√	√
Inductive reasoning and inductive leaps	√	√	√	√
Deductive reasoning	√	√	√	√
Predictive reasoning	√	√	√	√
Boundaries and limitations	√	√	√	√
Assumptions	√	√	√	√
Beyond quantification type analysis	√	√	√	√
Segmentation of concepts	√	√	√	√
Un-bundling or de-liquefying the				

integrated models	√	√	√	√
Identifying the allocated responsibilities	√	√	√	√
Short term and long-term objectives assessments	√	√	√	√
Cost-Benefit analysis	√	√	√	√
Confidence in validity of analysis	√	√	√	√
Packaging and positioning for decision making	√	√	√	√

9.8.5 Synthesis - Resolution-summary of Problems with traditional disciplines

SYNTHESIS - Epistemic Problems & Challenges	*Academia Barriers*	*Industry Barriers*	*Knowledge Barriers*	*Innovation Barriers*
Re-use and reframing of concepts prior to utilization	√	√	√	√
Epistemic catalysis	√	√	√	√
Recruitment	√	√	√	√
Integrating mechanisms that will appeal to the business ecosystem and related stakeholders	√	√	√	√
Interfacing mechanisms	√	√	√	√
Bridging and bringing together	√	√	√	√
Interfacing	√	√	√	√
Developing formulations of integrated concepts	√	√	√	√
Resolving potential dissonance	√	√	√	√
Incorporating diversity of views	√	√	√	√
Barrier removal for unification and aggregation of concepts	√	√	√	√

Connectedness embedded within the concepts and frameworks	√	√	√	√
Clustering of ideas and concepts	√	√	√	√
Epistemic Consolidation	√	√	√	√
Unity of purpose	√	√	√	√
Integration of key players	√	√	√	√
Brining the ecosystem together	√	√	√	√
Combinations and permutations	√	√	√	√
Innovation through Foresight	√	√	√	√
Seeing patterns of fit	√	√	√	√
Achieving unity of purpose	√	√	√	√
Consolidation with experiential knowledge	√	√	√	√

9.8.6 Evaluation- Resolution-summary of Problems with traditional disciplines

The Third Dimension provides SMEs with an effective check list or criteria of conditions of state or end-game objectives. They repreent a guide that can be applied to evaluate strategy-making concepts, developmental plans and scenario effectivness. As indicated below – the availability of the Third Dimension of Convergence-Abstraction can be applied to every domain of contributing knowledge.

EVALUATION - Epistemic Problems & Challenges	*Academia Barriers*	*Industry Barriers*	*Knowledge Barriers*	*Innovation Barriers*
Meta awareness	√	√	√	√
Setting goals and objectives	√	√	√	√
Strategic Intent	√	√	√	√
	√	√	√	√

Interpreting other persons use of the models and concepts and frameworks	√	√	√	√
How the 100 years of Management and academic intervention are being interpreted and utilized by the global community of strategy makers	√	√	√	√
Making judgments on the efficacy of their planned and future strategies	√	√	√	√
Comprehending the belief systems underpinning the uptake of the 100 years of academic thought and industry developments	√	√	√	√
Epistemic positioning of the minds of others and the Bloom stage of others	√	√	√	√
Evaluating the intentionality	√	√	√	√
Predicting behavior – in individual, groups and ecologies	√	√	√	√
Beyond observables	√	√	√	√
Concept and model creation	√	√	√	√
Evaluation of epistemic ecologies or combinations of models and functionality	√	√	√	√
Mental states and life cycle of activities	√	√	√	√
Appraisal	√	√	√	√
Transitive inference – sorting the relationships and hierarchies	√	√	√	√
Foresight on trends and demands	√	√	√	√
Change mechanisms at work	√	√	√	√
Recognition of the drivers	√	√	√	√
Governance	√	√	√	√
Compliance	√	√	√	√
Risk Management				

Alternative pathways	√	√	√	√
	√	√	√	√

9.8.7 General Theory of Convergence-abstraction to overcome problems in "traditional" disciplines by strategic utilization of the Third Dimension

The "Overall Summary" of the Bloom Taxonomy and the Boisot Ascent Routines confirms the relative ease in which solutions can be delivered to overcome the serious and generic difficulties confronting SME success. They all confirm the need for the unification of knowledge through the managed convergence and abstraction (thought bio-mimicry of the DNA-epigenetic elements) for SMEs to achieve success with the global knowledge spectrum.

In this context Figure 9.7 presents a further explanation of how the Convergence-abstraction mcehanisms of the Third Dimension achieve the required SME ascent routines of the Concept Solution, The epistemic feed-stock segments are illustrated in the left of the diagram, and are represented by the sources of their respective contributors (viz Academia, Industry and the Movements of Knowledge Management and Innovation Management). The barriers between them and the strategic intent of a SME-eGID engagement are a dynamic phenomena that will contribute to grow the knowledge gap between their supply-side and the demand-side factors.

It is argued that the epigenetic scientific platform, though bio-mimicry offers potential to dismantle the barriers and achieve the eGID connectivity. Epigenetic equivalents and conditions of state can overcome the structural dissonance in the availability of knowledge and its usability for SME-eGID strategy-making. To overcome both of these structural barriers, the Research proposes that a "General Theory" of convergence and abstraction. In Figure 9.6 for example, the combination of convergence management skills are necessary for the required epistemic ascent routines by:

(a) Navigating the Bloom Taxonomy for SME learning
(b) Mental Advancement of the SME-strategist to recognize the fact of "the unity of knowledge", and
(c) Developing a strategy-making capacity that actively identifies the potential for knowledge unification, and by-in turn developing a propensity to apply inductive, deductive, adaptive and integrative skills.

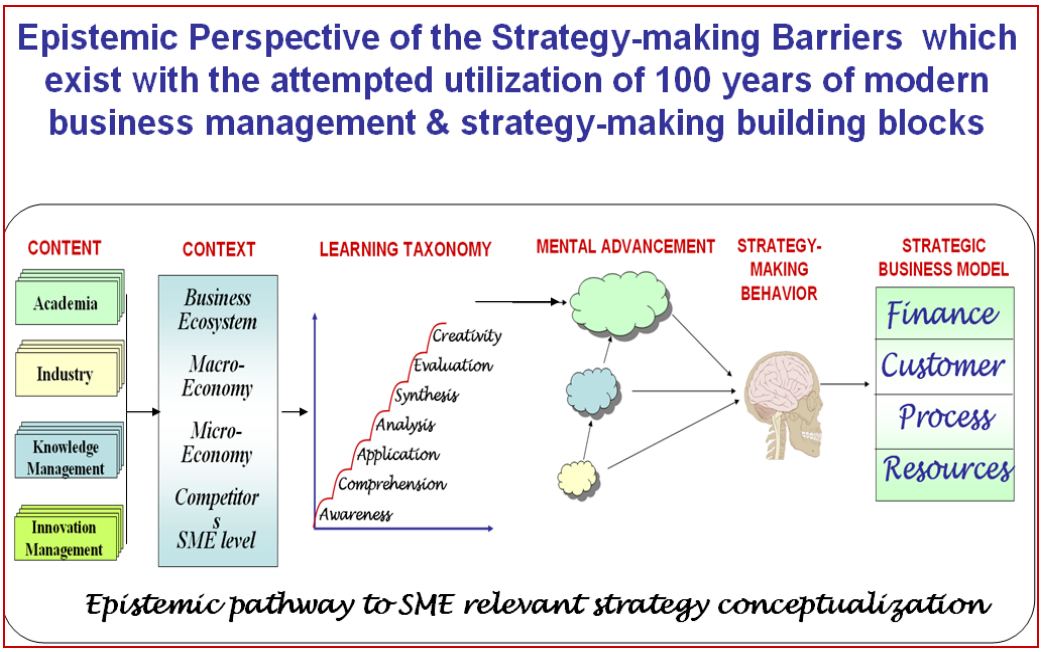


Figure 9.7 – Context of a "General Theory of managed convergence-abstraction" of epistemologies for SME strategy-making.

The overall problems facing SME strategy making can be strategically managed by segmenting them as illustrated in Figure 9.7. Flowing from the left of the diagram are the MNC-centric resources thatonce embedded with the Third Dimension can directly relate to potential problems in the different macro-economic, micro-economic and industrial settings. The Ascent Routines can be attained and the optimul optimum Bopisot epistemic position established. In the context of the advice provided by one of the world premier management consultants – the Boston Consulting Group (BCG) – the mindsets can then be programmed for Schumpeterian innovation. The confirming findings of the BCS research covers the strategic lessons from over 3000 firms. They have been found to use versions of abstraction and convergence to best create strategies that satisfy the Post-2000 era business challenges. BCG Consultants further argue that convergence management can deliver the required transformation challenges through the use of epistemic bridges, platforms, and scaffolds, etc.

9.8.8 The new SME Strategy-making culture with Convergence-abstraction

The case can now be argued for the development of a new culture in SME strategy-making. It requires a change in conventional thinking – where the elements of convergence and abstraction are a contingent inclusion ratjer than a primary consideration.

In this situation, every knowledge asset within the conventional knowledge spectrum needs to be epistemcilly vetted against the new culture of convergence and abstraction. Support for the proliferating use of the Third Dimension and the embedding of thematic traits is recorded by the researchers at the Massachusetts Insitute of Technology. MIT delivers a program which aims to assist firms with "thought leadership" for the creation of new strategies through convergence management of environmental and business issues within the changing business landscape. While some individual convergence generating concepts are offered, this Project argues the case for systematic transfer of knowledge from Nature's epigenetic parallels. MIT's program would

be boosted further by the use of DNA's Convergence-abstraction complexes for the growing integration of content, production systems, value proposition delivery, distribution channels, and brands for innovation in new product-service development.

Figure 9.8 illustrates how the new culture's Third Dimensional elements need to be considered at the very start of any strategy-making exercise. The digram seeks to illustrate the symbolic requirement of the "Convergence-Abstraction Culture" being rained-down upon all Pre-2000 and Post-2000 entities and stakeholders in the eGI landscape. The new Third Dimensional culture is not a repudiation of pst business research and models. Rather it is a renewal and revitalization. Rigid thinking makes way for agile and flexible thinking to manage fast-paced change, keeping up with changing consumer demands within eGI. The case is further argued that Convergence-abstraction generates a real-time mindset for monitoring and gaining valuable insights epistemic themes (similar to theThird Dimension) which are shaping the eGI future.

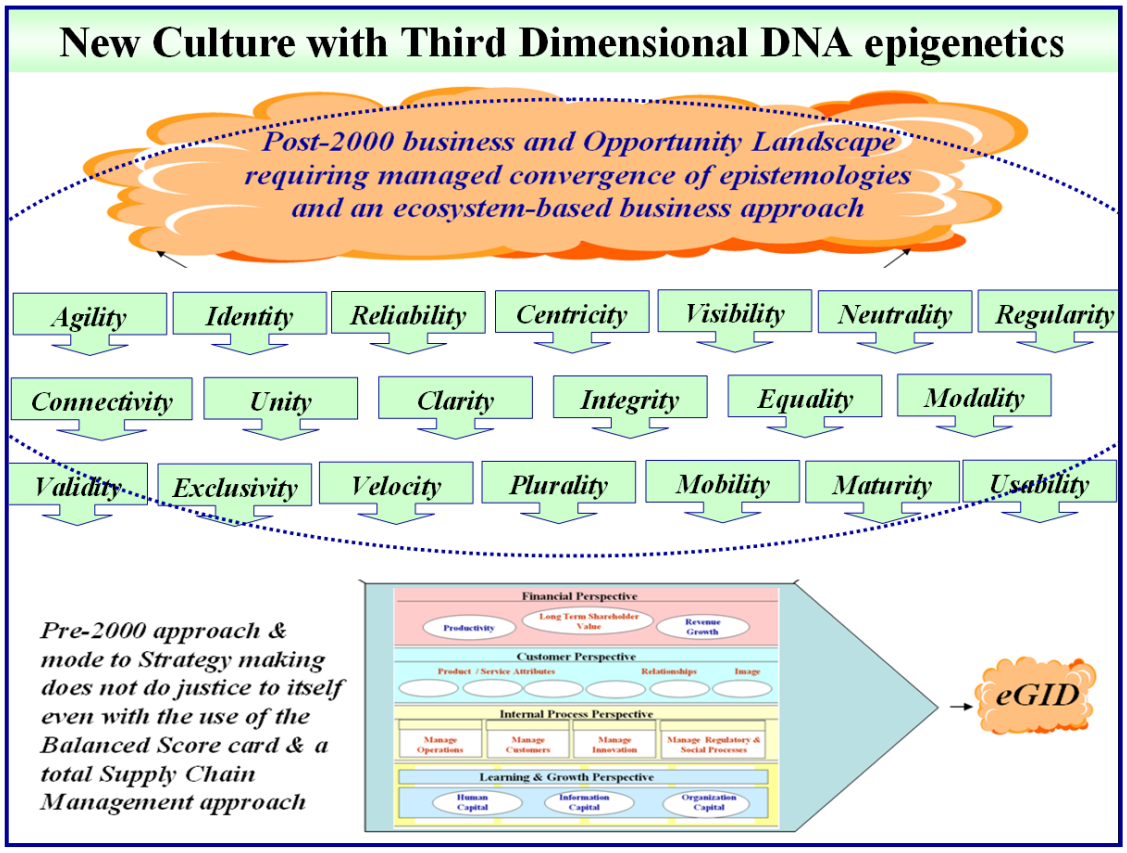


Figure 9.8 – Using Convergence Management as the pre-condition not the "After-the-fact" end-of-pipe result of conventional strategy-making

Figure 9.8 further illustrates the need for convergence management exemplar to enable existing business models to be more adaptable re-framable and re-configurable, so as to better satisfy the Post-2000 demands. This project's thesis is therfore based on both biological and industry-type foundations that can assist in the required process of Decontextualizing → Transforming and →Recontextualizing before eGID value can be extracted.

9.9 Chapter Conclusion

The Chapter concludes with the epistemic recognition that the learning value from Bloom - Boisot's cognitive "Ascent Routines" for SME strategy-making could only be achieved by the addition of a Third Dimension to transform the Information Tsunami into an SME-relevent spectrum. We have demonstrated how this missing dimension needs to be embedded within in the MNC-centric building-blocks that together make up the conventional strategy-making spectrum. Only then can lessons from Nature's knowledge spectrum be captured and utilized under the Bio-mimicry conceptual metaphor.

Chapter 9 has refelected on the barriers outlined in Chapters 5-8 and it has been argued that the Bloom-Boisot Third Dimensional conceptual solution can be offered to the Project's 4 Research Questions. The admixing of thematic conditions of state (such as agility, integrity, identity, mobility, etc) is the missing link for the re-framing of the 100-year-$1 Trillion Tsunami into a SME-eGI knowledge spectrum,

From this position we advance to Chapter 10, with a focus on operationalizing the processes of embedding the "third dimension" for SME strategy-making. In Chapter 10 we expect to demonstrate how the epigenetic factors of the bio-mimicked spectrum can directly transform the conventional strategy-making spectrum and achieve the cognitive "Ascent Routines" to SME-eGI.

CHAPTER 10 THE BIO-INSPIRED BUSINESS STRATEGY MODEL

10.0 Introduction

This Chapter constructs and presents operational details of a the Bio-mimicry conceptual model developed in Chapter 9. In Chapter 10 we therfore advance its development into an Operational Model for SME-relevant strategy- making. The aim is to satisfy the Research Question of creating a model that is more suitable and tangible for testing and validating.

The Operational Model builds on the work of the earlier Chapters which argued the case that valuable lessons are available from the bio-epistemic parallels that exist between individual business strategy-making building blocks and their epistemic counterparts within molecular and cellular biology and proteomics. Together the bio-mimicry generated Operational Model and its Nano-scale bio-epistemic Controllers offer a framework to which SMEs can easily relate because of their human connections.

Importantly this framework functions as an epistemic bridge and platform for SMEs to utilize both (i) the resources of the 100 years of pre-2000 business strategy studies, and (ii) the virtually unlimited source of epistemic metaphors, similes, and parallels for on-going research in the disciplines of Systems Biology, Oncology, Genomics, Epigenomics, Proteomics, Regenerative Medicine, and RNA genomics. Together they offer SME strategy-making the opportunity for accelerated learning and strategy development.

The manner in which the individual parallel elements are fitted together are explained in this Chapter. The overriding context of the epistemic parallels and their integration is the Research Question to develop a framework or pathway for SME success within the global economy, within a business ecosystem.

The Operational Model and the Nano-scale bio-epistemic Controllers cover the total life cycle of any planned SME business participation in the global economy. Each stage and segment within the Operational Model is grounded within its equivalent epistemic parallels which this Chapter seeks to highlight.

Finally the Research Project offers the bio-mimicry based Operational Model for Conceptual, Perception and Practical Testing in the Chapters that follow.

10.1 Definition of Terms and Concepts used in this Chapter

Emergent conditions of state are defined as the portfolio of physical, mental, and psychological attributes and defining characteristics and drivers required for knowledge and innovation generation.

Portfolio of emergent – convergent epistemic signatures are defined in the context of the emergent conditions of state that are being used in Nature's Knowledge Management systems and being deployed in an active manner for SME strategy-making.

Renaissance of business strategy-making knowledge–base is defined in the context of the new opportunities expected to be created from the embedding of the Epistemic Exemplar with Pre-2000 knowledge.

Epistemic Exemplar is defined in the context of being the continuum or spectrum of epistemic conditions of state utilized by Nature and being re-used in the Bio-mimicry – based Model building.

Emergent–nano–scale signatures are defined in the context of elements in the Exemplar that create the thematic conditions that need to be embedded within the Bio-mimicry – based new Model.

Meta- Management Model is defined as the new Bio-mimicry based Model which brings Pre-2000 knowledge into renaissance and Post-2000 relevance.

10.2 Epigenetic underpinnings of the Operational Model

We commenced the Research Project with the admission that the complexity of the global economy required the use of an epistemic exemplar or a catalyzer so that SMES could successfully develop the required strategies. As the result of the research for such an exemplar, the Project has identified the potential for Nature's Knowledge Management System to function as the epistemic catalyzer. The principles and the advantages of attempting to use the concept of Bio-mimicry for strategy making were grounded in the Post-2000 understandings of Systems Biology. The dominant issue remains that Nature's knowledge management relies on an information-molecule system complete with nano-scale controllers that is embedded within the DNA-RNA contained in the nucleus of every human cell.

Every one of these 100 trillion cells, individually and in groups, respond to the nano-scale controllers that orchestrate the total life cycle and well being of the human life-form. When failures or diseases occur, Post 2000 medical research and understandings are starting to confirm that the nano-scale controllers have been involved. Their impact can be traced to the presence or the absence within Nature's real-time information management processing system. The outcomes involve the expression of proteins that is used by nature for its daily life-cycle of information exchange for a variety of operations.

Using Nature's Knowledge Management System as the epistemic exemplar, the Research Project has developed epistemic building-block type parallels and an epistemic bridge that can deliver

lessons for SME strategy-making. In this Chapter we explain how these building block equivalents can be integrated into a strategy-making business model.

The model itself is grounded on the corporate sub-systems, entities and transactional and developmental functions needed by any business, in the Pre-2000 or Post-2000 mode. What is unique is their integration with the "nano-scale" equivalent controllers. Post-2000 knowledge has shown that the rich diversity, convergence, innovation, emergence, and adaptations in the human life-from result from the interaction of Nature's nano-scale controllers with the rest of the system-infrastructure.

The interaction between the nano-scale controllers and thee established business units is similar to the IT-Industry's acclaimed social networking phenomena. Nearly 300 million persons participate in sites such as Facebook, Twitter, and Youtube, etc.

We utilize the metaphor of the social networking phenomena to explain how the nano-scale bio-epistemic controllers can similarly perform the aggregation of knowledge and information for SME strategy-making, just as yhe Facebook site does.

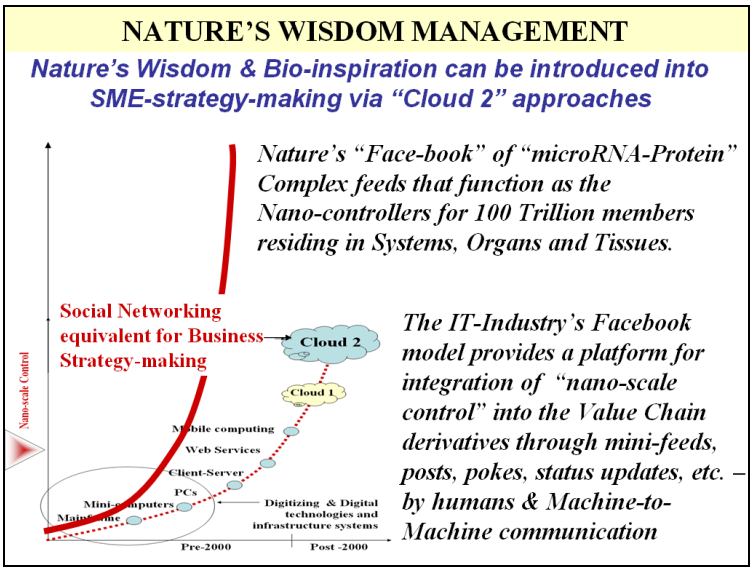


Figure 10.1 Epistemic basis for Operational Model and Lessons from Nature

Figure 10.1 illustrates the epistemic positioning between the IT-industry's use of nano-scale inputs (or their equivalents) within the popular social networking sites. The diagram compares the development of knowledge and information in the IT-industry (Right curve) with that of Nature (Left curve). While acknowledging that the scale of Nature's capacity is significantly much larger than that of the IT-system, the diagram seeks to explain how the epigenetic nano-scale controllers (ie the Third Dimension of Convergence and abstraction) offers SMEs the greatest opportunity for learning and linkage to eGI. .

10.3 Bio-inspired Meta-Schema for SME strategy-making

It is noted that the individual descriptions and presentations of the integrated Model are totally dependant on the bio-inspired use of the Nano-scale Controllers that provide the value adding considerations at each stage of the model. Together the Nano-scale Controllers make up the key differentiator of the bio-mimicry-based Operational Model. Without the Controllers, the Model would simply revert to the status of just another concept or framework that have been endlessly making up the knowledge-base of the 100 years of business strategy-making studies.

The key premise in the Operational Model is therefore the required and mandatory embedding, and enhancement of the Model's individual elements with the Nano-scale Controller. The Project seeks to explain this requirement in the presentation of the individual segments now being addressed.

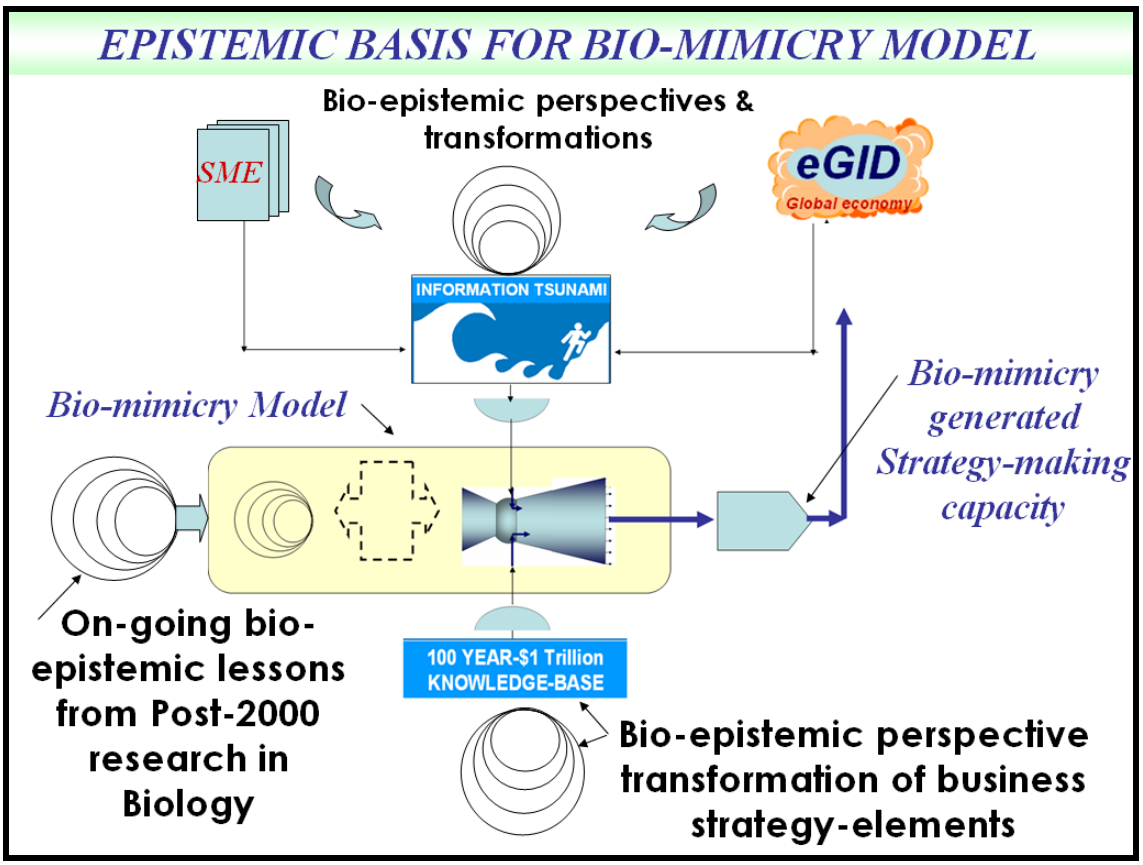


Figure 10.2 – Bio-inspired Meta – schema for SME strategy-making

Figure 10.2 illustrates the epistemic basis upon which the Bio-mimicry Operational Model is to be constructed in this Chapter. In earlier Chapters the epistemic association has been developed and lessons gained from Nature's management of knowledge that revolves around the integration and use of Nature's nano-scale bio-epistemic controllers (the Third Cognitive Dimension) with the main-stream protein synthesis infrastructure. These controllers are directly or indirectly responsible for the richness and the elegance of Nature's innovation and variety and Nature's total life cycle management of the ecosystem. Chapter 9 created the link between Nature's nano-

controllers and a parallel list of nano-business controllers (developed by the Research Project for business strategy-making).

The Operational Model being developed seeks to utilize the Thid Dimensional factors in each of the Model's segments – the Inputs, the Processes and the Outputs of SME strategy-making. The identified bio-epistemic parallels for business therefore need to be embedded within the mainstream business strategy-making processes and the knowledge-bases being accessed by the SME. The embedding and the required transformation of the two main SME knowledge-bases are represented in this diagram as part of the inputs to the strategy-making model. A further input (from left of the diagram) represents the continued harvesting of lessons from the bi-technology industry.

10.4 Bio-inspired Meta-management of epistemic inputs

The Meta Model being constructed requires elements for the Model's Input stage before the epistemic renaissance can be achieved.

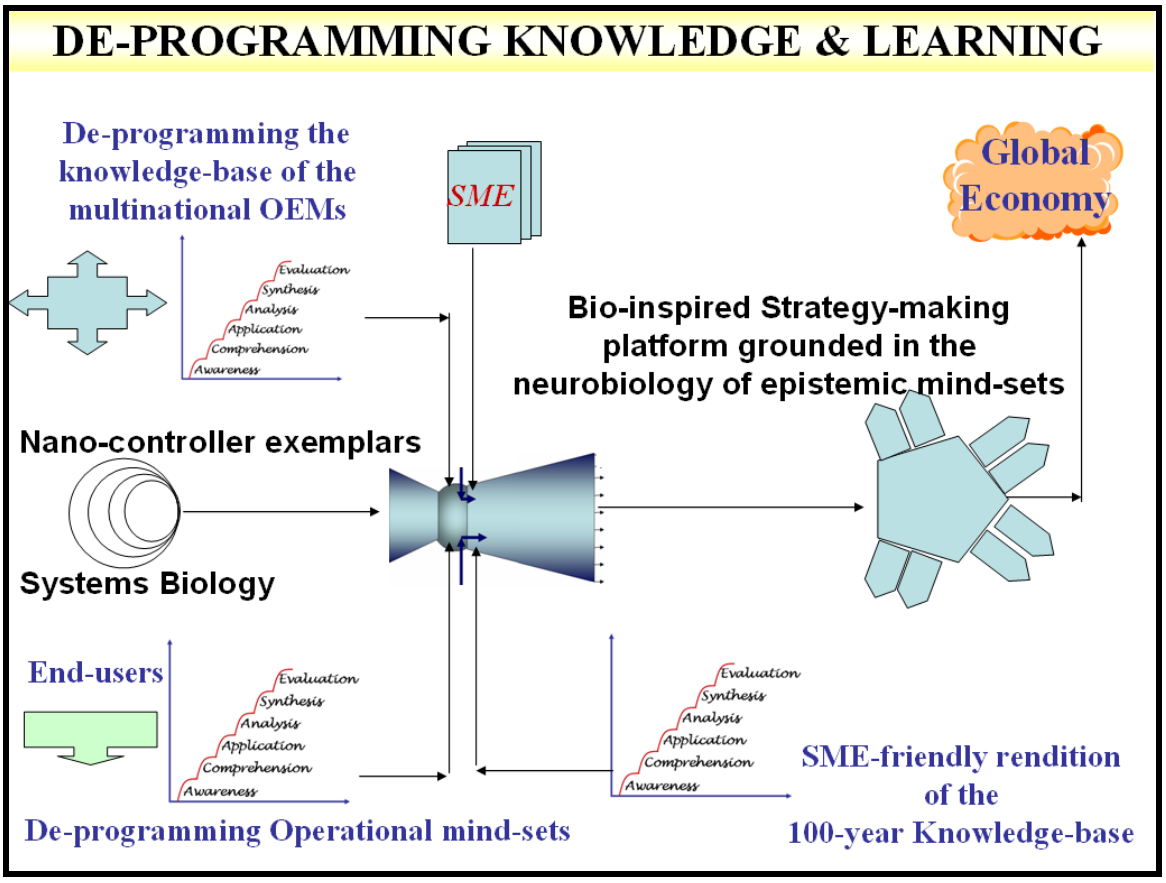


Figure 10.3 – Operational Inputs for the Meta – Model

Figure 10.3 illustrates the basis for the development of the Bio-mimicry-based operational model for strategy-making. The predominant epistemic issue is role and functioning of the Nano-scale bio-epistemic controller (shown at the centre of the diagram). Feeding into the Nano-scale

Controller system (shown on the left of the diagram) are the epistemic lessons from Systems Biology. The strategic lessons in human biology are based on the role that MicroRNA and other nano-scale molecules that deliver and control the gene expression and protein synthesis in human biology. The Bio-mimicry paradigm is based on the parallel that just as these nano-controllers are strategically important in the development and transactional functioning of the human life-form, so too should the thematic emergenet controllers be used as inputs to generate appropriate strategy-making for SME businesses.

Feeding from the Nano-scale business Controllers (shown on the far right of the diagram) is the epistemic platform that has been constructed from the lessons available from the 100-year - $1Trillion knowledge-base and the Post-2000 Tsunami of global business knowledge. This Platform functions as the multi-functional epistemic scaffold into and from which the range of business model innovations and the portfolio of business ecosystem joint actions can develop in the form of Post-2000 strategies.

10.5 Bio-inspired Meta-management of epigenetic processing

The Operational Model is constructed to infuse / embed / integrate and transform all Strategy-making Inputs, Processes and Outputs with the portfolio of bio-epigenetic equivelents of the Third Dimension.

10.5.1 Elements of the Operational Meta Model

The Bio-mimicry based Operational Model and its suite of Nano-scale bio-epistemic Controllers are composed of the following elements:

(i) Recognition of the problems confronting the SME and the context for development and utilization of the Model
(ii) Problems in accessing the Pre-2000 knowledge resource-base and its on-going contributions made by Academia, Technology and the disciplines of Knowledge Management and Innovation Management
(iii) The availability of the Bio-epistemic Exemplar with its portfolio of emergent conditions of thematic states
(iv) The availability of the Epistemic "Mix and Match" mechanism for bio-epistemic lesson transfer
(v) The need for a Transactional segment and its context of strategy-making
(vi) The need for a Developmental segment and its context of strategy-making
(vii) The Multi-sided Platform scaffold segment and context for strategy-making
(viii) The epistemic feed-stock and on-going source for continual advancement of the Operational Model (with lessons from system biology).

Each of these segments and their respective contexts are addressed within the integrated framework of the SME needing to be a part of a business ecosystem. In most cases it is assumed that the SME seeking to utilize the Operational Model will either be the initiator or the promoter of such business ecosystem organizations.

10.5.2 Emulation of Nature's Knowledge Management

The Meta-Model seeks to emulate Nature's Knowledge Management system in the context of SME-eGID strategy-making. In this context, the elements of the Bio-mimicry based model and its processing functions and its strategy-making outcomes – all need to be considered as an integrated system.

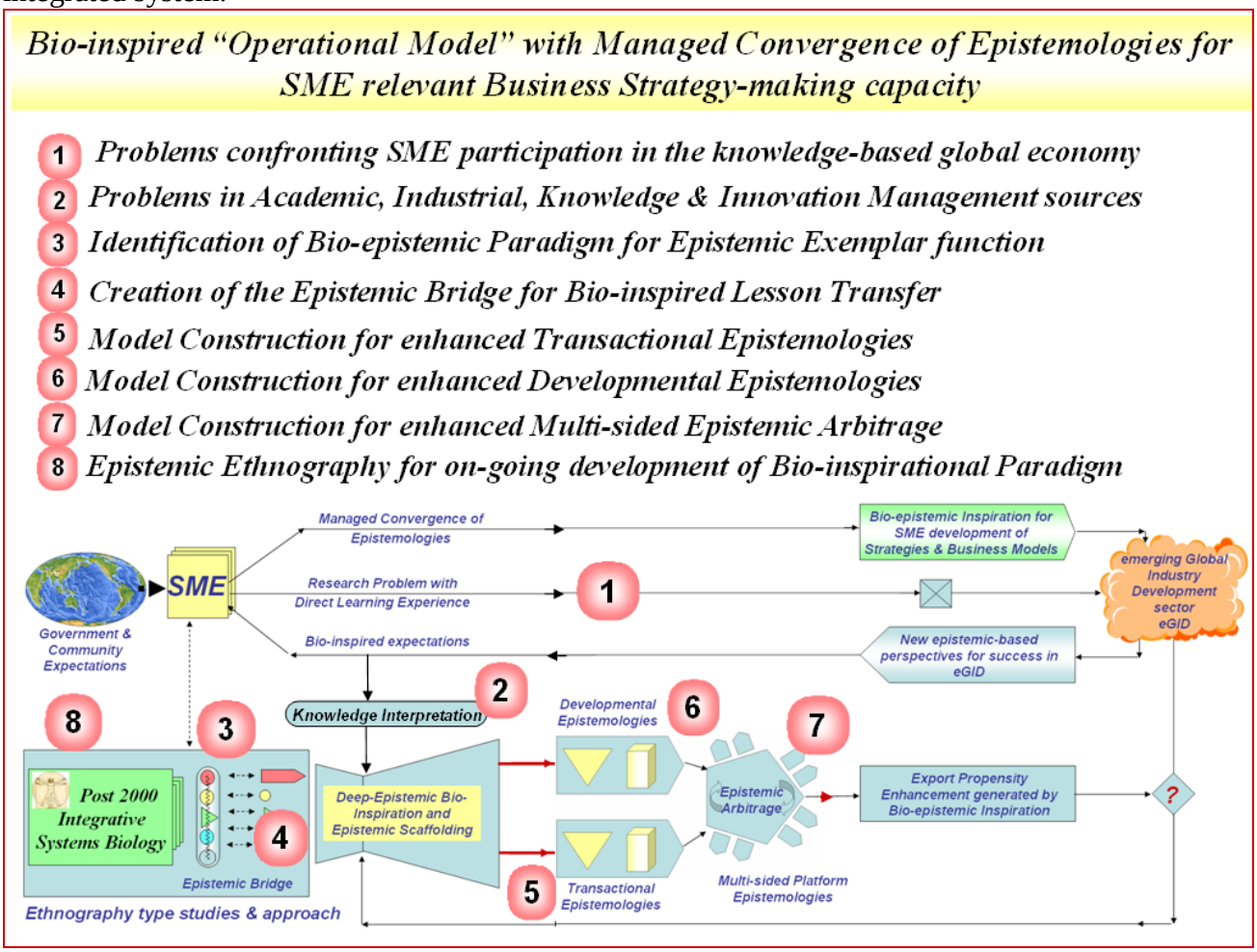


Figure 10.4 – The elements of the Bio-inspired Operational Model, developed by the Research Project and offered to assist SME with strategy-making

The manner in which the individual elements are integrated into a single Operational Model is illustrated in Figure 10.3. Elements within the illustration are arranged in a logical manner with the sequence of sub-contexts starting with the difficulties confronting SME participation in the global economy. From this epistemic position, the Model sequentially and progressively address the sub-sections that finally present the SME with an enhanced and strategic capacity to make contact with the global economy.

10.5.3 How the Meta Model works

The manner in which the Bio-inspired Model is expected to function is explained further. As illustrated in Figure 10.3, the following steps are involved:

Step 1 – SMEs are expected to review and reflect on their existing knowledge base and the connection they wish to establish between themselves and other ecosystem membership. This is the epistemic feedstock, generally based on Pre-2000 knowledge that is in need of the Post-2000 Renaissance.

Step 2 – Barriers confronting the Pre-2000 knowledge base of the SME and the Business Ecosystem for connecting with the Global eGID targets are further detailed and reviewed at this stage. Step 2 essentially seeks to also separate out:

- Inputs
- Outputs, and
- Processing resources – including technologies assumptions, limiting factors, and other elements upon which SMEs are reliant.

The Strategic Intent that underpins stage 2, is the need to focus on the epistemic feedstock that has been made available from the 100 year - $1Trillion Information Tsunami. The focus is on the Preparatory work needed before they are modified, adapted, embedded and or replaced with the elements from the Bio-epistemic's portfolio of emergent functional elements.

Step 2 specifically requires that the knowledge – base be conceptualized into functional groups of cycles, chains, bridges, repositories, carriers, transformers, modifiers, fabricators, unifiers, and units of exchange etc. This conceptual - functional segments are then better positioned for the epistemic renaissance.

Step 3 – involves the identification of the Bio-epistemic emergent conditions of state that would be the catalysts for the Post-2000 renaissance of the Input – feedstock. Selections of emergent - epistemic signatures need to be made from the conditions of agility, identity, integrity, reliability, unity, visibility, proximity, and velocity etc.

Depending on the scale and scope of the strategy-making exercise several of these emergent thematic elements from the Exemplar – portfolio may be required for the Post-2000 Renaissance.

Step 4 – represents the Bridging-embedding stage, where the "Mix and Matching" of the micro-genes with the macro-gene (Pre-2000 business building blocks) are obtained. In this stage, selected emergent traits or themes will be combined with all building blocks within a chain of business entities, to endow or embed the thematic characteristics that can re-frame and generate innovations from the Pre-2000 scaffold.

For example, a chain of business entities or activities may be embedded with new targets on generating or operating with higher levels of visibility, velocity, and or reliability. The value – adding from the bridging/ mixing/ embedding of this stage needs to be continually reviewed to determine the innovative value that is so created. This "Build – Mix – Review"

stage will need to continue until the clear commercial value and reliability of the resulting innovations become evident.

Step 5 and 6 – This stage accepts as inputs, the selected "innovation – seeded" concepts that have been created and finalized for their innovation potential. The "seeded" selections need to be categorized as either:

(a) Transactional focused epistemic constructs, or
(b) Developmental epistemic construct.

The segregation is of importance for strategy-making because the embedded thematic emergent traits will set their short and long term linkages with transactional productivity and structural longevity. Each of the transactional or developmental pathway will be implemented by their dedicated pathway, and each specific pathway will need its own combination of additional thematic catalysts, in addition to the common/ mandatory requirements of integrity and reliability, etc.
Step 7 – presents the Post-2000 Business strategy-making scaffold of the Multi-sided Business Growth Platform.

The Bio-mimicry lessons from System's Biology are readily available for the management of this platform. For example in the Post-2000 era of Tissue Engineering and the synthesis of artificial organs, bio-scaffolds are first created. These nano – scale structures and created with the cardio – vascular infrastructure for the platform and its ecosystem entities. Only thereafter are the stem cells deployed to populate the scaffold – platform together with nutrients and growth factors.

In a similar way, the Multi-sided platform should be set up to nurture business – strategy innovations that are generated from the Mix-matching exemplar. Uniquely the platform also needs to simultaneously encourage and derivatives of the "core" competencies (like the Prahalad Tree). The outcomes of the Platform and its derivatives are the new strategy-making entities and concepts that can facilitate connection with the eGID of Post-2000 global business.

Step 8 – is both the first and last of the epistemic segments that make up the Model. Findings in Post-2000 systems Biology need to be continually harvested to develop a parallel portfolio of metaphors and Epistemic Functional Elements equivalents. Step 8 is specifically important for SME strategy-making because "eGID" is nothing but another representation of the epistemic behaviors that can be traced back to the nano-scale DNA – nucleotide epistemic signatures of convergence.

10.5.4 Problems confronting SME participation in the knowledge-based global economy

The Research Question poses the challenge of whether a universal model or framework can be developed for SME participation in the knowledge-based global economy. The main problem confronting the SME is the sheer intensity of change and velocity and variation in almost every

factor of production and in almost every regulatory system, and in almost every delivery and communication system.

The magnitude and scale of the problem is enormously skewed against the SME because of the limited resource-base from which SMEs typically operate. SMEs need to gain from the lessons from several of the largest Multi-National Corporations (MNCs) in the world. They have recognized this problem and have actively sought the creation and development of strategic alliances to provide integrated solutions.

The Operational Model's segment recognizes this problem and presents the case that combination of ecosystem is required with the Nano-scale Controllers to generate clarity of the dynamics of the target market sector. The Operational Model therefore suggests that the SME makes formal stages of the target market sector generate in the context of the Nano-scale Controllers, as follows. For example, the Model recommends the posing of questions such as:

- What are the key nano-controller elements that can be identified in the sub-sections of the target market's structure and delivery challenges?
- What segments among the Customer Value Propositions are characterized by the nano-scale controller elements?
- Is there a pattern of agility or mobility or any other nano-controller element within the products and services being offered in the target market sector?
- What are the key drivers of the velocity or speed requirements within the product-service offerings?
- What themes or nano-scale factors are best valued by the market, in terms of say identity or reliability in the product-services characterizing the market dynamics?
- To what extent is there visibility of the changes in the channels of commerce and exchange within the market sectors that are now confronting the SME?

The Model therefore requires a degree of active preparatory work from the SME. Such work is framed in the illustrated elements of Figure 10.5. On the left of the diagram are the sources of new Bio-epistemic lessons for the development of the convergence spectrum – with its emergent thematic catalyzers. On the left is the Model that "feeds" itself from the systems Biology feedstock. The resulting combinations should be evaluated against amongst others, the Bloom Taxonomy (top of the diagram).

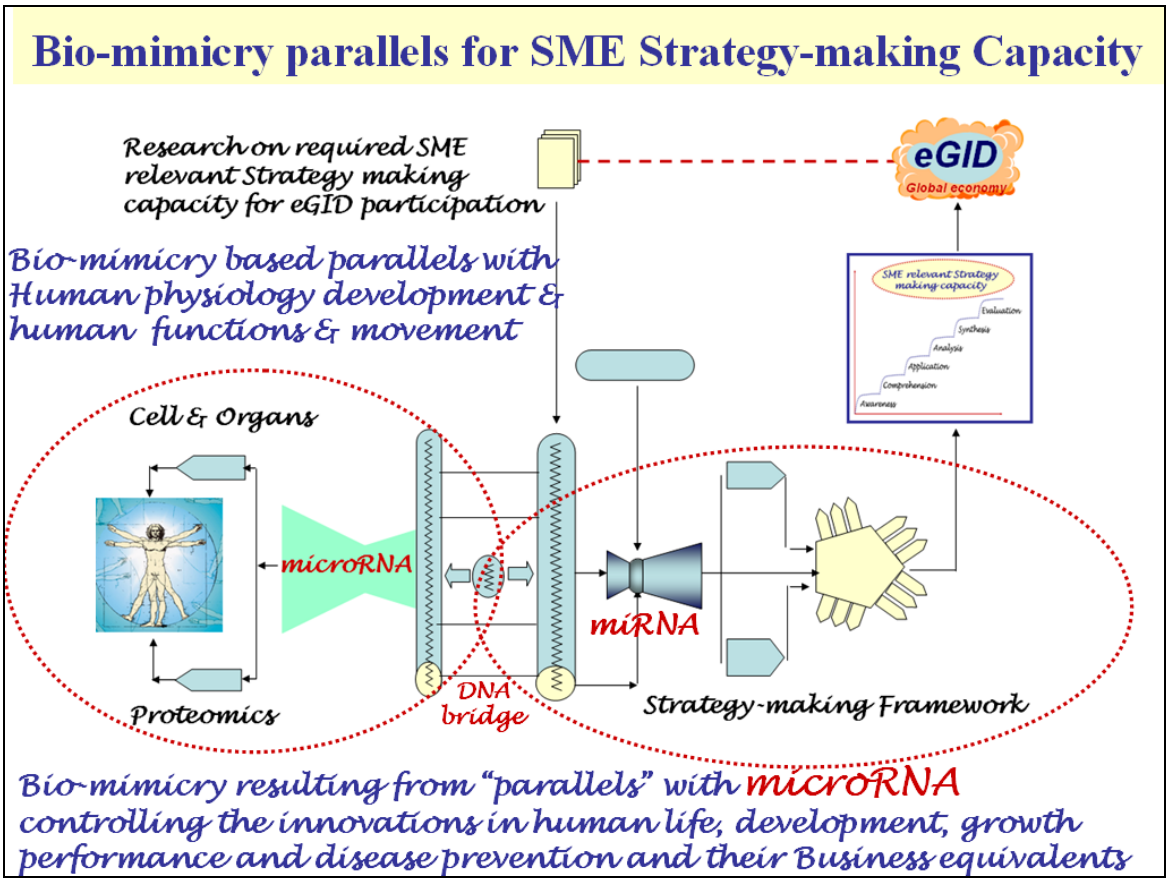


Figure 10.5 – Proactive management of the Bio-inspired Model

10.6 Implementing the model – a typical scenario for strategy making using the Operational Model in combination with the Nano-scale bio-epistemic Controllers

The manner in which a typical strategy-making project can utilize the Operational Model and the Nano-scale Controllers is outlined in this Section. The exercise commences with the hypothetical need for a SME to develop a strategy that involves a business ecosystem in which the SME will participate. In this context the following will take place:

(i) Step 1 - Confronting the problems faced by the SME and the context for development and utilization of the Model. Once this recognition is established within the SME decision makers, the key issue involves identifying the "nano-scale controllers" that are in play within the target market sector. The SME needs to enter into a preliminary research mode to determine the extent to which these nano-controllers are responsible for:

- the demand-demand that exists for the product-service
- the supply-drivers that are responsible for the emergence and availability of the product-service
- the integrating of functions and benefits being delivered by the product-service

- the trends in the degree of utilization or under-utilization or replacement of the of the product-services

The key issue is to transform the challenges facing the SME into a problem that is more suited for analysis because of the focus on the nano-scale controllers.

(ii) Step 2 – Translating the Strategy-making challenges into the concepts and models that are closely associated with the SME project expectations. The Operational Model advises that this translation process stage should formally involve the four segments and sources of information - i.e. the disciplines of Academia, Industry, Knowledge Management and Innovation Management. The Model should relate the Step 1 findings to the concepts or models or frameworks that have been addressed by earlier studies and cases in these disciplines. The concept or framework for example could involve a specific variation of the different supply-chain-delivery channel systems.

10.7 Bio-inspired Meta – management of strategy-making outcomes

The expected outcomes of the Bio-epistemic Exemplar are the new capacity for SME-strategy-making to create new industries and to develop new project opportunities in emerging global markets. More specifically the Model offers the capacity to facilitate and catalyze innovation on an unlimited scale. This is achieved with the mixing and matching of the Pre-2000 and Post-2000 Business Buildin–Blocks. The Convergence-abstraction epigenetic factors offers potential to inject thematic innovations. A choice exists on selecting the epistemic catalyzers for the different sectors of the emergent– business spectrum and global landscape.

The outcomes from the Bio-inspired model can therefore be illustrated as the outcomes from a catalytic transformation resulting from the embedded "Epigenetic
Mixer–Converter–Transformer and Innovation" functions.

Figure 10.5 for example presents this "catalytic converter" as the dominant mechanism that allows the Pre-2000 knowledge-base to break away from its potential obsolescence status. All of the barriers identified in Chapters 5-8 explain the flat or horizontal or drooping nature of the Pre-2000 approaches to SME strategy-making. The drooping nature is further assured by the reluctance for SMEs to accept that MNC-centric strategies are of relevance to their business situations and resource availabilities.

With the "Break-away" catalytic conversion system however, the knowledge curve of usability (y-axis) is time domain (x-axis) enhances the usability levels of the MNC-centric knowledge.

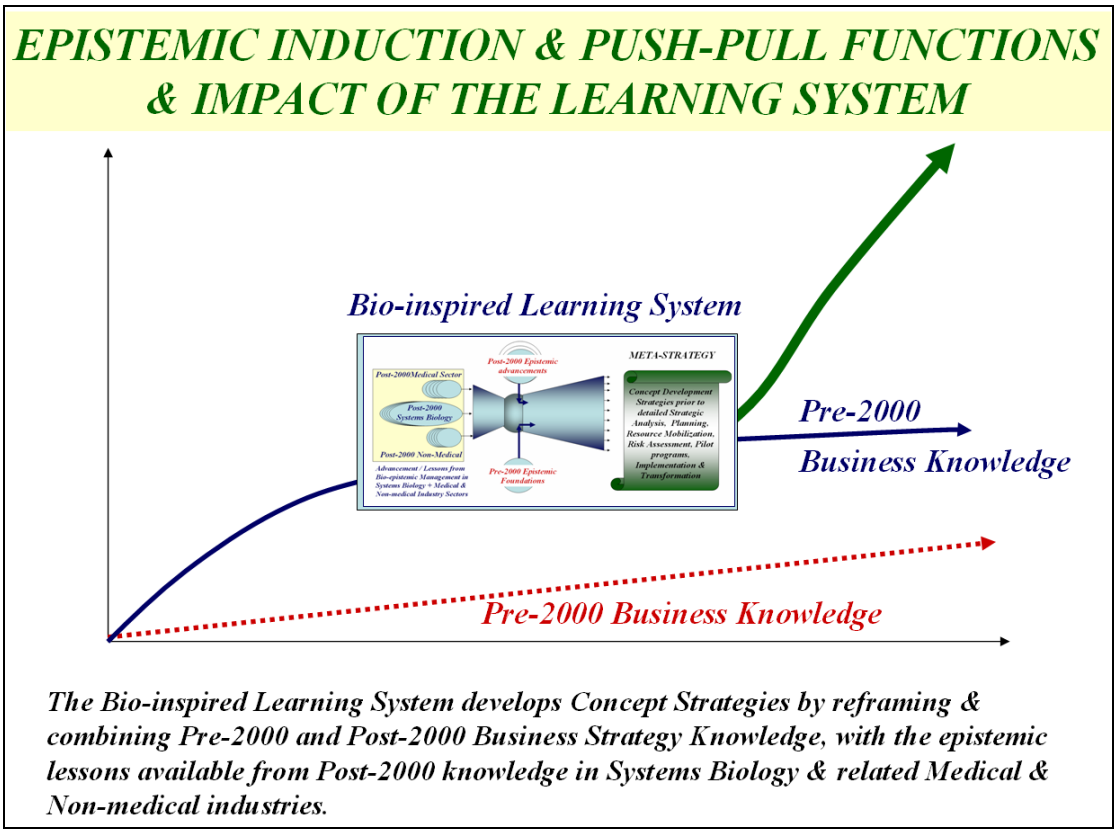


Figure 10.6 – Epistemic Catalysis for Innovation and Break-out

10.7.1 Bio-epistemic outcomes with the epistemic spectrum

The case has been made that the 100 year-$1Trillion Information Tsunami does indeed constitute an epistemic spectrum, as illustrated in Figure 10.6. The Model's outcomes result from the interaction between thematic emergent catalysts and the knowledge-base spectrum. The spectrum is the mother-lode for the harvesting of business building blocks that are eventually transformed by the epistemic catalysts. As a result the building blocks are characterized with convergence – enabling mechanisms of identity, reliability, integrity, usability, etc. This is the systematic approaches that can create new opportunities and outcomes for SME-eGID strategy-making.

10.7.2 Renaissance and Innovation outcomes with Porter Value Chain

Figure 10.7 for example explains how the phenomenal impact of epigenetic factors results from the admixing, adaptation, and modifications mediated by its convergence-abstraction elements. Effectively 20,000 genes that were supposed to create an equal number of proteins are now known to be responsible for over 2 million proteins. The epigenetic factors are active determinants in the adaptation of generic structure and function into more than 100 Trillion cells, Over 100 million of these cells are replaced every minute. It is the convergence-abstraction mechanisms are responsible for their replacement, integration and dynamic re-functioning within

the 200 different types of cells. The cell transformation and functioning are catalyzed by the epigenetic factors that are being hosted by these same cells in their respective DNA molecules.

The functioning of the bio-epistemic transformations,from the left to the right of the diagram is illustrated by the progressive build-up of nano-scale entities (epigenetic factors such as microRNAs) to the full human life form. Figure 10.7 illustrates how the epigenetic factors commencing from the far left continually impacts on each succeeding bio-developmental phase.

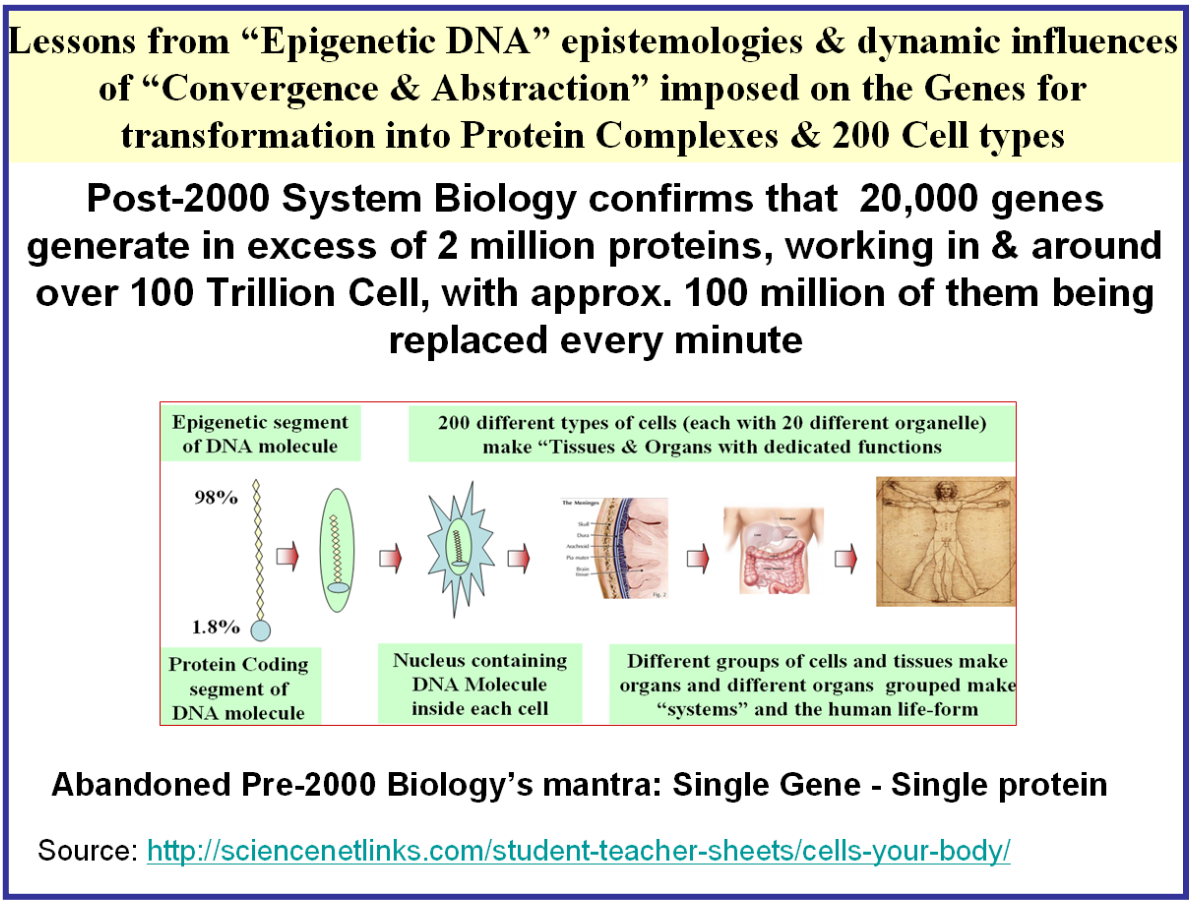


Figure 10.7 Transformation knowledge in the science of Post-2000 Biology resulting from new understandings and use of epigenetic factors for whole-of-life development and function.

Post-2000 Clinical Science uses the epigenetic markers as idnicators and proof of the physiological well being and the pathologies of the human life-form. This is made possible by modern bio-electronic sensors and nano-scale precision instrumentation that can monitor and measure the dynamics of the epigenetic factors.

Remarkably the transformations taking place in the sciences of Post-2000 Biology are the result of these epigenetic factors. Their convergence-abstraction entities of Agility, Connectivity, Identity, Reliability, Integrity, etc., apply equally to both of the parallel worlds of business and biology. Hence the transfer of these convergence-abstraction factors from biology to their business correlates is a relatively less demanding challenge.

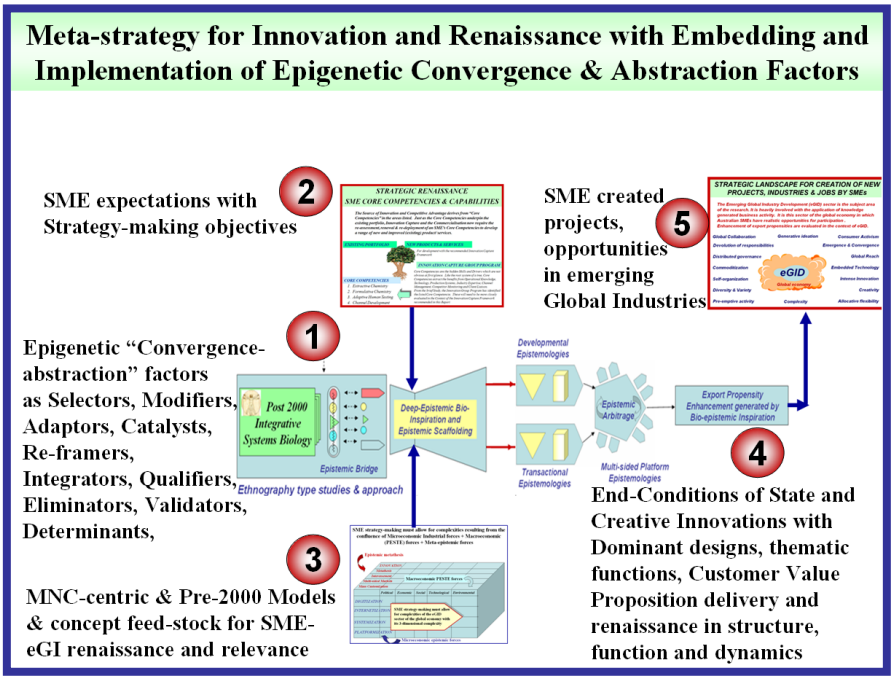


Figure 10.8 Model's application of its epigenetic factors to transform the Porter Value Chain with new thematic functions and perspectives

For example, in Figure 10.8, these epigenetic catalysts from Item 1 can be applied to the well accepted 1980's era "Porter Value Chain" (Item 3). The Model's Inductive-deductive platform (Item 4) accepts all of the cognitive inputs for their transformation into new and innovative strategy-making concepts. Each of the 9 value chain activities (Item 3) can effectively be rejuvenated with the embedding of selected thematic characteristics, to navigate the macro-economic PESTE forces . The result of the embedding of the correlates is the creation of new and innovative Post-2000 business concepts that are more focused on the Post-2000 PESTE forces.

Epistemic catalysis and strategy-making renaissance is made possible by the immutability and the scientific grounding of the epigenetic factors.

As illustrated in the upper right of the diagram (Item 5), the epistemic parallels can be applied to achieve new and innovative functions and outcomes from chains of visibility, reliability, agility, etc. The epistemic catalysis has in effect been responsible for the several derivatives of the Porter Value Chain. Where its outcomes require depart from the existing Customer Value Propositions, it is necessary that a new capacity be developed for SMEs to create new "thematic" chains, cycles, bridges and platforms, with the epigenetic catalyst in singular or multiple themes. Figure 10.8 illustrates the epistemic juxta positioning of the Pre-2000 models with the epigenetic factors as the driving mechanism to rejuvinate and deliver renaissance.

10.7.3 Epistemic Renaissance with the Toyota Production System

Toyota's well renown Pre-2000 Business Mode, developed in the 1970s has been credited in delivering Toyota the status of the No 1 Automaker of the world. Since the 1980s major

consulting industry programs have evolved with claims to install TPS-type stratgies for business growth and survival in the rapidly chaning global market. Successful implementation and embedding of the Toyota Production System in external organizations have achieved limited success.

It can be argued that the use of the Model's epigenetic factors could actually be the hidden dimension required for successful transference.

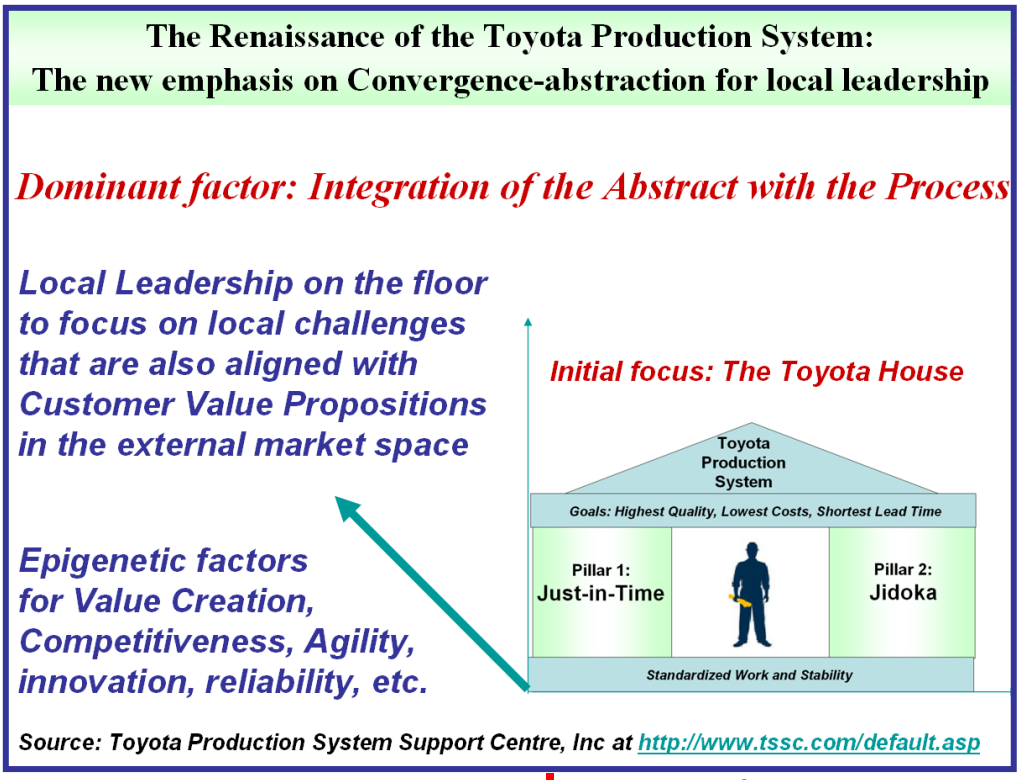


Figure 10.9 The hidden dimension and the Renaissance of the Toyota Production System

The lower right corner of Figure 10.9 illustrates the Pre-2000 focus on strauctre and process of the elusive TPS "House" and its Japanese cultura-business concepts – all of which focused on the use of a building or structure as the teaching and learning metaphor.

More than 30 years later, the admissions are being made that it it is the "human factor" that underpins all of the functionality and outcomes of the TPs, rather than its "building-house" metaphor.

More specifically it is now acknowledged that the local leadership of the process worker, or front-line manager is the key to success of the TPS transference-methodology. The front-line manager in the "Gemba" needs to maintain a dual focus – on the process and on the "abstraction" issues that links the local tasks to the emerging global industry sectors.

For this to take place, the house metaphor also needs the epigenetic metaphor.

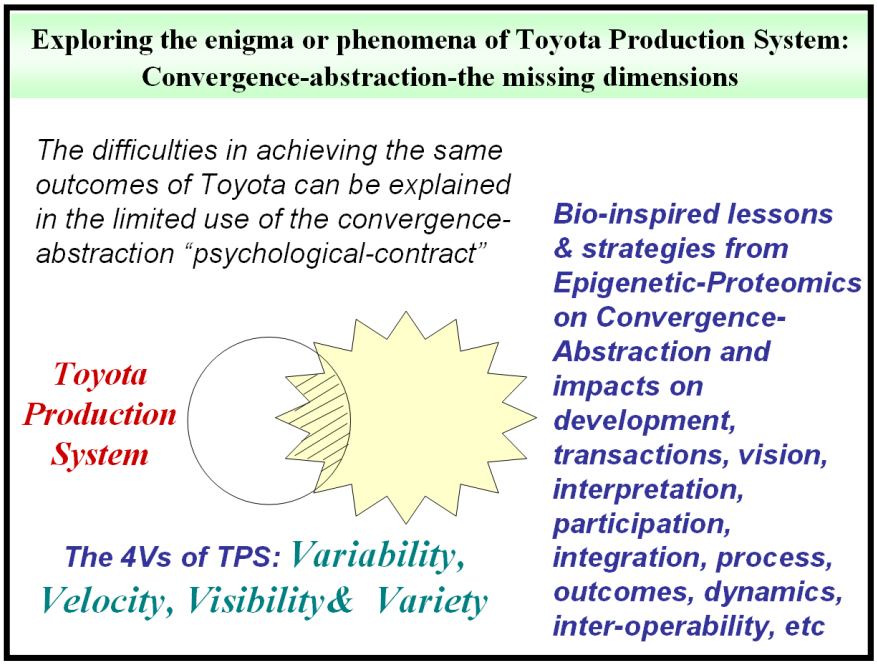


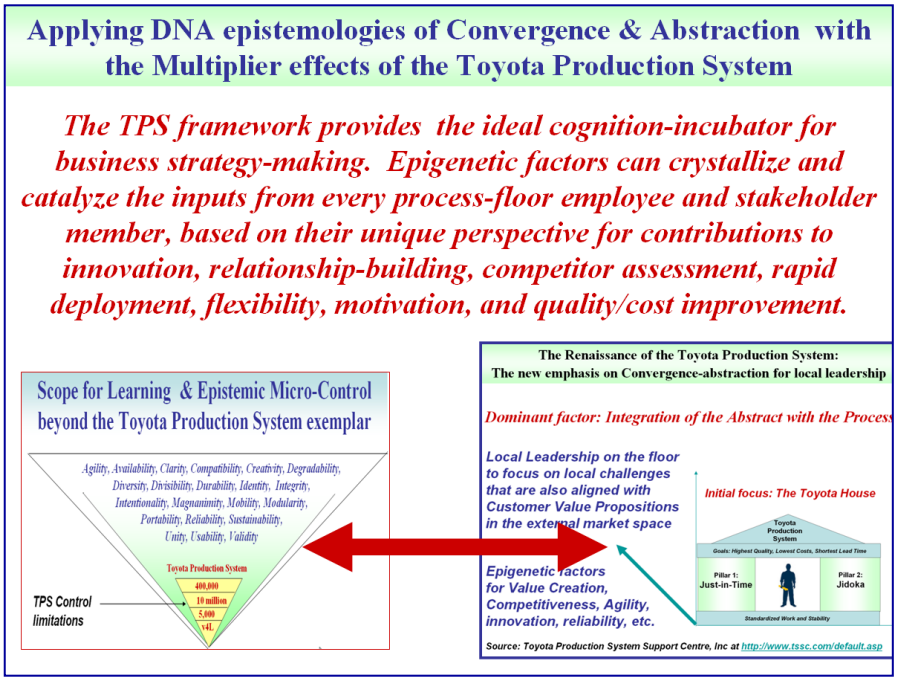
Figure 10.10: Exploring the Toyota Production System Phenomenon

Figure 10.10 reveals the meta-strategy behind the success of the TPS. TPS' meta strategy focuses on 4 epistemic exemplers. As indicated they are the principles of managing:

(i) variability
(ii) velocity
(iii) visibility, and
(iv) variety

These 4-V epistemic catalysts are claimed to be responsible for enhancing all of Toyota's manufacturing, sourcing and supply chain operations.

Figure 10.9 illustrates how the "inverted" Toyota Production System (TPS) is the spear-head for innovation, strategy-making and collaborative action and success. The TPS system engages more than 400,000 collaborations to produce 10 million cars/ annum with an average of 5,000 components per car. In addition the TPS protocols interacted with the knowledge spectrum.



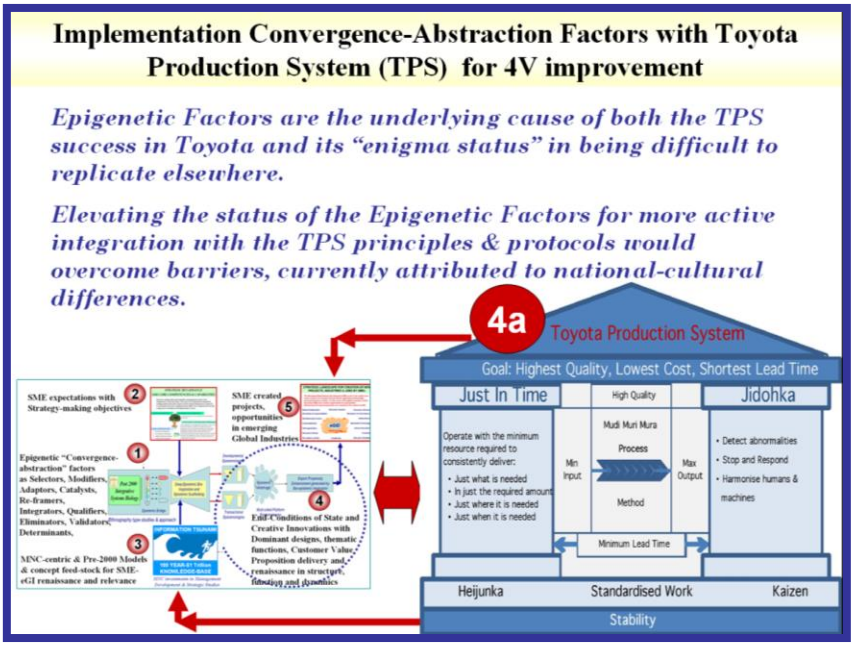


Figure 10.11: Implmentation of Convergence-Abstraction Factors in Toyota Production System

In Figure 10.11, a comparison can be made between Toyota's 4-epistemic catalysts and the relatively unlimited number of epistemic catalysts that are available from Nature's Convergence Management System. Where Toyota uses 4 catalysts, SME capacities can benefit from the full range of thematic – emergent – convergent factors. Agility, identity, integrity, reliability, mobility, usability, proximity, validity, etc are only some of Nature's epistemic catalysts in the portfolio made available for SME strategic capacity – building.

10.8 Operational Model Summary

In just two cases of strategy-making successes from the Pre-2000 knowledge-base, it has been possible to demonstrate how Nature's epistemic catalysts can rejuvenate and deliver a renaissance. Business models that are tagged by some as being long-in-the-tooth can be rescued from potential obsolescence or irrelevance in the Post-2000 era.

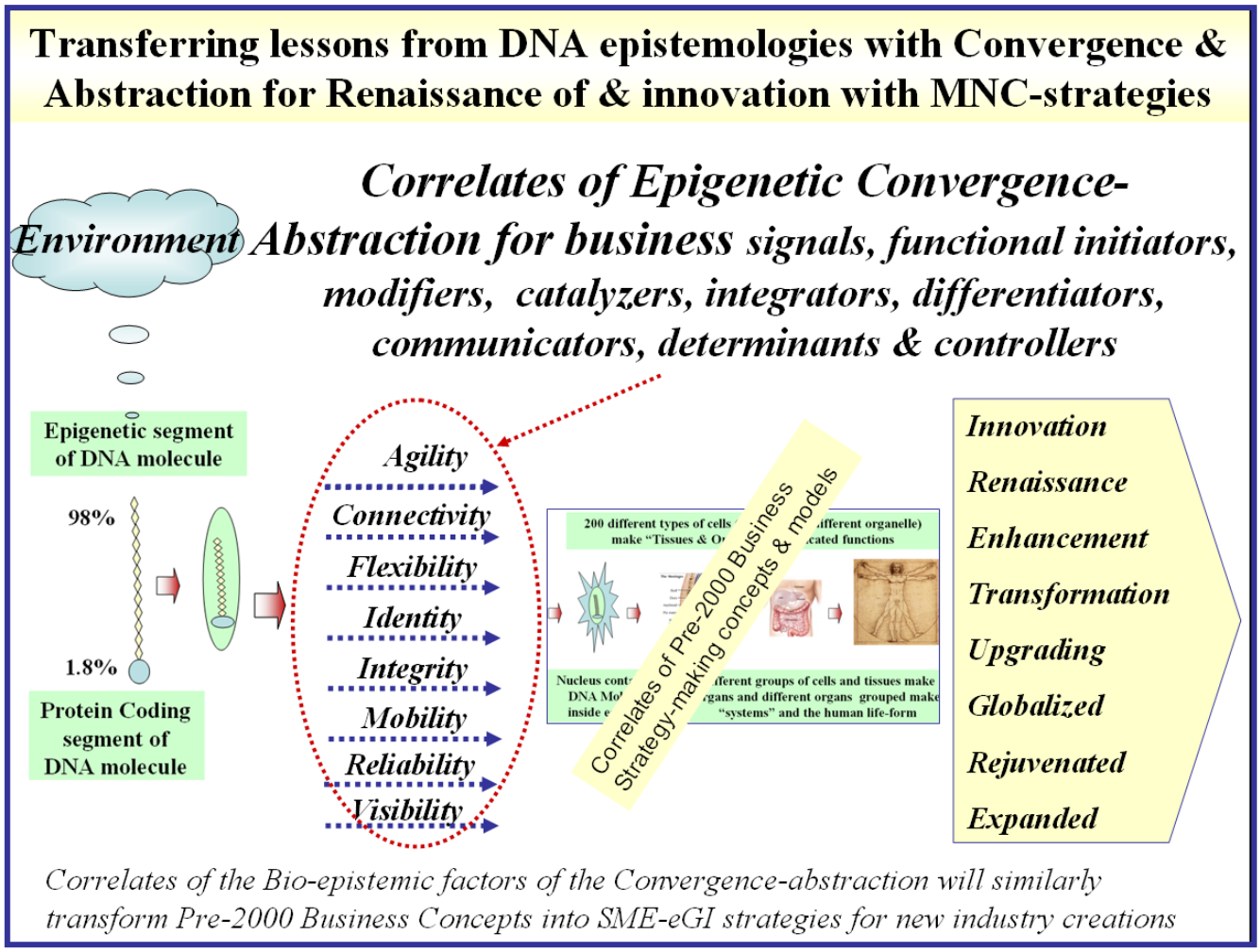


Figure 10.12 Renaissance of MNC-centric Pre-2000 strategic concepts for new eGI industry creation

Figure 10.12 illustrates the new opportunities and potential for renaissance with epistemic catalysts and why they will never run out of feedstock. This is because the source of the epistemic catalysts will continue to be made available in unlimited numbers from the lessons gamed from Human Systems Biology (left of the diagram). Their catalytic embedding within the correlates of Pre-2000 building blocks (eg the supply chain network in the lower centre) will generate the new innovation and transformations.

A key issues in the illustration is the transferability fo the "Convergence-abstraction" factors that remain in all contexts – biological and business related. The recommended epigenetic factors are

directly responsible in both cases for the phenomena of their relevance and validity in the trillions of cell units, and billions of bio-chemical transformations that take place every minute in the human life-form.

10.9 Chapter Conclusion

In Chapter 10 we set out to develop and present a Bio-inspired strategy-making Operational Model that utilized lessons from Nature's Knowledge Management system. The Bio-epigenetic Model was created to enable SMEs to utilize ready-to-use Convergence-abstraction conditions of state. The Model is framed to mimic Nature's use of Epigenetic Catalysts that catalyse, geenrate, transformr and characterize the integrated successes of Pre-2000 and Post-2000 Systems Biology. The Operational Model seeks to similarly provide SMEs with a ready-to-use framework so that the values resident within all strategy-making building blocks can be extracted with rigour and relevance for the Post-2000 era of SME-eGI.

The Chapter explained how the Bio-inspired Model was structured to embed selection from the portfolio of epistemic catalysts, at each of the three stages of:

(i) Epistemic Inputs for Model development
(ii) Epistemic Processing, and
(iii) Epistemic Outcomes and Capacity building.

The Chapter then explained how the Model could be applied to rejuvenate popular Pre-2000 business models from the Porter Value Chain and the Toyota Production System. Importantly, the Bio-inspired Model building and its case-presentation completed the central requirement of their Project's four Research Questions.

Having created a Model for SME strategy-making renaissance, we proceed to Chapter 11 in which the first two of the Project's Research Questions will be further addressed, viz:

(i) Can the Model offer a framework manage the structural dissonance between MNCs and SMEs that presents SME success in the global economy, and

(ii) Can the Model operationalize the required learning to overcome the dissonance barriers.

Chapter 11 will specifically address the required farming of issues and the learning requirement to deliver the expected renaissance from the Bio-inspired Model.

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CHAPTER 11 BIO-INSPIRED BUSINESS MODEL IMPLEMNTATION

11.0 Introduction

This Chapter develops and presents the epistemic "concept-transforming" system which would allow the Bio-inspired Model (presented in Chapter 10) to be utilized by SMEs despite the MNC-centric nature of the "Information Tsunami".

In this context further use is made of the correlates of the DNA-molecule as the epistemic exemplar or metaphor to explain:

(i) how Pre-2000 "strategy-making business models" are similar to the concept of Pre-2000 Genetics, and

(ii) how the lessons of Post-2000 DNA epigenetic factors can generate the new Post-2000 eGI strategies that can deliver innovation and new global business opportunities.

Time-domain era	*Biology's epistemic lessons*	*Strategy-making parallels*
Post-2000 – the new era of innovation, multi-functionality, and system thinking characterized by emergence, convergence and complexity	Epigenetic segment of the DNA molecule comprising 98% of the DNA structure and now being identified as the mega-strategy that controls the functioning of the 1.8% protein-coding genes	By admixing the convergence-abstraction concepts with the conventional business models (genes of the business-strategy domain) new innovative perspectives, business models, innovations, and newly emerging industries are being created. The eGI is the equivalent of the epigegentic transformation taking place within Post-2000 Systems Biology
Pre-2000 with its initial 100 year focus and limitations that have restricted the full potential of knowledge utilization and innovation	Protein-coding "genes" that account for less than 1.8% of the DNA molecule – but whose effects are the most visible in the proteins sustaining human life	Pre-2000 business strategy models are akin to the genes. Examples include the concepts of the Porter Value Chain, the Supply Chain Network, the Functional divisions of labour, the and even the concept of the Multi-national Corporation

This Chapter also outlines a further range of perspectives on how the bio-mimicry metaphor (epigenetic exemplar) and its correlates can indeed harvest ongoing innovations and new industrry opportunities through SME-eGID strategy-making.

The challenge of "epgenetic" concept-framing relates to the need to develop capacity building within the SME resource-base. The concept-framing capacity is required so that the epigenetic lessons of convergence and abstraction from Post-2000 Systems Biology can be harvested for strategy-making. This Chapter also seeks to develop conceptual linkages for innovation transfer immediately as lessons emerge from the on-going developments taking place in Systems Biology,

In this Chapter we de,monstrate how the concepts and teachings of "Thought leaders" in Business strategy-making such as Drucker, Doz, and Nornann, etc. can be made more easily usable for SMEs with the assistance of the epigenetic-exemplar within the Bio-mimicry Model. These pioneers have stressed the need for concept-based protocols to re-frame experiences taking place in other industries in the crafting of strategy. In their arguments, the capacity for re-framing can boost and deliver epistemic leverage and create new pathways for innovative thinking and innoavtion delivery.

The Chapter also explains how the innovations taking place in Biology's "4 P Medicine", Regenerative Medicine, 3D-Biological cell printing Stem Cell Research, Proteomics, Protein Complexes, etc. offfer the pathway for parallel SME-eGI innovations.

In the Chapter 12 that follows, the validity of the Model's Learning Management System will be presented that will in turn respond to the Research Question on whether a Learning Management System can be implemented within an epistemic framwork that offers rigour and relevance for SME-eGI business success.

11.1 Terms and Concepts used in this Chapter

Frames – are defined as conceptual constructs that provide the epistemic scaffold over which strategy-making plans, entities and thematic approaches can be implemented.

Concept-framing is defined as the Project's methodology of bio-inspired strategy-making using correlates of the 1.8% genes and the 98% epigenetic factors of abstraction and convergence

Correlates are defined as the parallel systems within Biology and Business strategy-making

Correlates of Pre-2000 Genetics are defined as the group of Pre-2000 Business Concepts and Models used by MNCs in strategy-making

Correlates of Post-2000 Biology are defined as the group of new business Concepts and Models that would be made available to SMEs for eGI strategy-making

Thematic approaches – are defined in the context of a guiding theme or direction with which the strategy-making concepts are associated for concerted action in strategy-making.

Parallel worlds – are defined as the parallel estimestic interactions taking place in traditional business landscape for which parallel stream of events are occurring in the nano-scale world of proteomics and and other bio-synthesis.

Proteomics are defined in the context of aggregated "genes" or building blocks that deliver vital functions for the human life form and in its epistemic grounding generated from nano-scale spatio-temporal dynamics of the DNA-nucleotides.

Protein-coding genes accounting for 1.8% of the DNA molecule are defined as the epistemic correlates of Pre-2000 knowledge and models used in the era's MNC-associated strategy-making

Convergence spectrum – is defined as the continuum of the convergence systems that enable matching, adjacent, related, integratable and re-configurable entities to be integrated for different epistemic perspectives.

Bio-inspired Model – is defined as the strategy-making framework presented in Chapter 10 which seeks to integrate Pre-2000 and Post-2000 on the basis of Convergence Management.

Belief systems – are defined as the mental approaches to assist with the management of convergent epistemologies.

Behaviour systems – are defined in the context of actions and mental conditions of state for strategy-making.

Epistemic catalysis – is defined as the knowledge – derived processes and mechanisms for the managed convergence of epistemologies.

Stimuli – is defined in the context of origination thoughts, suggestions or actions that initiative different pathways for strategy-making.

Epigenetic stimulation – is defined as the perspectives or metaphoric suggestions that can initiate, adapt, integrate and or re-configure the epistemic building blocks that normally expected from the correlates of protein-coding genes.

Epistemic correlates – are defined in the context of metaphoric parallel concepts in Biological and Business strategy-making systems (based on their common grounding in nucleotide-based Convergence Management System).

Epigenetics – is defined in the context of the 98% DNA's functioning as the "Input", "Processing" and "Controlling" actions that determine the validity of the protein – correlates (ie the building blocks that are uniquely customized based on the epigenetic stimuli).

Meta strategy – is defined in the context of the required supervisory level for conventional making and for its leveraging of the bio-inspired epistemic metaphors.

Meta strategic competencies – are defined as the new competencies required for SMEs to over-sight, supervise and manage the transfer, re-framing and implementation of the innovation-generating frames from Post-2000 systems Biology.

MicroRNA (miRNA) is defined as an epigenetic DNA element that is used as an example of one of the types of bio-epistemic "meta-level" controls used by Nature's Knowledge and Wisdom Management

miRNA is defined as a single stranded DNA gene that offers epistemic lessons by the manaer in which it is first created inside the cells Nucleus from the DNA but then inteferes with the expression of certain types of protein-coding genes.

Interference Mechanisms of miRNA are defined as one of Nature's mechanisms on how it can preferentially create conditions for the expression of good proteins (good strategies) to be initiated for the developmental good of the human life-form (business ecosystems and strategies). Alternatively it can prevent harmful proteins from being created (business failure and disasterous strategies).

Epistemic Catalysts – are defined as the portfolio of emergent conditions of state that represent the macro-assembly of nucleotides, amino acids, proteins, and other bio-molecules that enable, facilitate and integrate convergence and unification of outcomes.

11.2 Bio-inspird Model Implementation Strategy

The Project's Research Questions focuses on epistemic learning, eGI pathways, and conceptual framing and the challenges of using Pre-2000 MNC-centric resources. It translates into whether SMEs (in their relatively resouce-disadvantaged and remote positioning on the I-R Grid) can utilize the Bio-inspired Model presented to Chapter 10 for successful global participation.

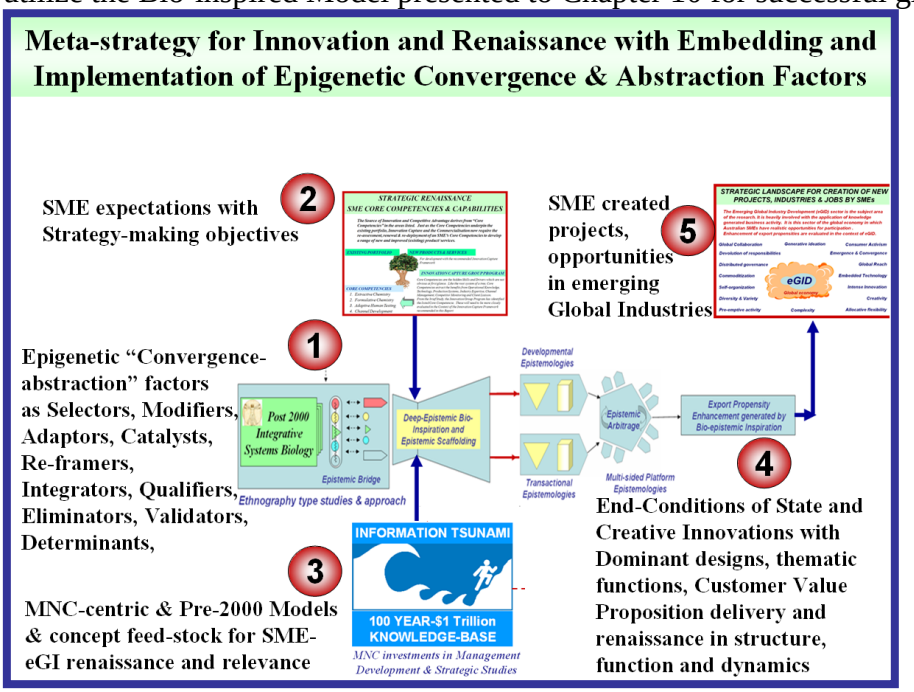


Figure 11.1 – Meta-strategy for renaissance and innovation from Pre-2000 MNC-centric stratgy-making resources

The Model of Chapter 10 is Item 1 within Figure 11.1. It is the engine for the creation of new innovations and renaissance for SME-eGI new business development. Item 2 represents the SME expectations, realities, and experiences of the eGI business landscape. They are part of the cognitive feed-stock for strategy-creation. Similarly Item 3 is cognitive feed-stock that is available from the MNC-centric resources of the 100-year $1Trillion inforamtion Tsunami.

The epigenetic factors of the Model can be visualized to induce, embed, deduce, modify, integrate the feed-stock to then generate the innovations and the renaissance which would be valid to the SME-eGI landscape of Item 5.

In this Chapter we seek to reinforces several of theissues that form part of the Models' potential to create a Meta-strategy for Innovation and Renaissance.

11.2.1 The need for implementation with epigenetic convergence-abstraction correlates

The case is presented in the affirmative based on the following:

(i) Innovative frames can be generated by the managed switching of SME cognition and their thoughts, beliefs, mindsets, and lessons. The switching between the "two-parallel" worlds of bio-epistemic lessons and their uptake for Post-2000 business success need to be grounded in convergence and abstraction

(ii) The Bio-system world consists of unbounded numbers of sub-worlds or epistemic ecologies – thereby making the epigenetic correlate transfers (with its convergence and abstraction lessons) available on a scale that is theoretically without limit

(iii) Switching and leveraging lessons from the epistemic ecologies can provide Post-2000 with an accelerated portfolio of Business innovations, strategic thinking ecosystem development, convergence and synthesis of multiple thoughts and perspectives, and eGI catalysis.

(iv) Lessons from the biology of human life are easy to internalize, and SMEs can therefore embed the epistemic catalysts from Post-2000 Biology into the Pre-2000 Business Building Blocks for their renaissance and revitalization in the new eGI context

(v) SMEs can also with relative ease, systematically monitor the world of Systems Biology's Ecological domains for examples and on-going lessons in convergence management and the harvesting of abstraction themes.

11.2.2 Meta-strategy pathway to eGI

Figure 11.1 provides the context for the harvesting fields of Post-2000 Systems Biology and its successful advancements across each of the wide rage of new scientific domains. The Post-2000

lessons almost exclusively have resultd from DNA-nucleotide convergence management spin-off in the epigenetic domains of the DNA molecule that constitutes epistemic ecologies that in turn make up the human ecosystem.

Almost every epistemic ecology identified in Post-2000 Systems Biology offers lessons for Post-2000 relevant strategy-making. A new paradigm for innovations and innovative strategy – making can then emerge as metaphorical correlates that would be underpinned by scientific research on Nature's Epistemic Exemplar.

The focus is therefore on how to deploy the Bio-inspired correlates. SME-relevant "concept-framing" needs to be generated, justified and shared among SME-led ecosystems for innovation capture. Specifically the Project's Research Model needs to overcome the corporate–level dissoance between SMEs and MNCs in their differential resource-base, their experiences with global markets, and their mobilization capacities, etc. .

These differences and dissonance limiations extend beyond physical infrastructure, and physical access to finance, joint-venture coalition building, and the availability of globally dispersed agents.

From an epistemic veiwpoint however the corporate–entity dissonance can be overcome through correlates of Nature's convergence and abstraction. All of the Bio-inspired lesons are therefore available to all human persons, whether they are engaged in SME or MNC employment.

From this epistemic viewpoint, each SME person therefore possesses the capacity to leverage their "Mind-sets and Mentation" processes to systematically harvest the lessons of the Bio-inspired Model and thereby create new businesses and new industries in eGI.

It is in this context that this Chapter responds to the Research Question 3 and the need to create a learning pathway to eGI. It thefore focuses on the Meta-strategies required by SMEs to implement the Bio-inspired Model with extractive epistemologies.

Figure 11.1 illustrates the two parallel worlds of Business and Biology over which SME mindsets need to achieve epistemic ascendancy. SMEs need to attain a capacity for "meta-level" type oversight and managerial supervision. This is the pathway offered by the epigenetic metaphor.

In the left of the diagram for example is the first of the 2 parallel worlds – the world of Post-2000 Systems Biology. This world delivers the lessons on convergence and abstraction and how individual and seemingly disparate resources are functionally bleneded together. Generic "genes" (like Pre-2000 knowledge assets) are re-vitalized to create on-going bio-innovations. The richness of human life and its different racial and gender representations, each with their competencies and skills demonstrate the power of the Bio-epistemic Model.
The use of the epigenetic equivalenst of convergence and abstraction serve as the exemplar for the world of new Post-2000 Business strategy-making (lower right circled area in the diagram). The Meta-strategy approach results from the cognitive overlapping of the two parallel worlds.

The overlapping initiates the meta-strategic pathway to eGI for the development of mimicked concepts for the creation of the new portfolio business concepts from the old Pre-2000 MNC-base.

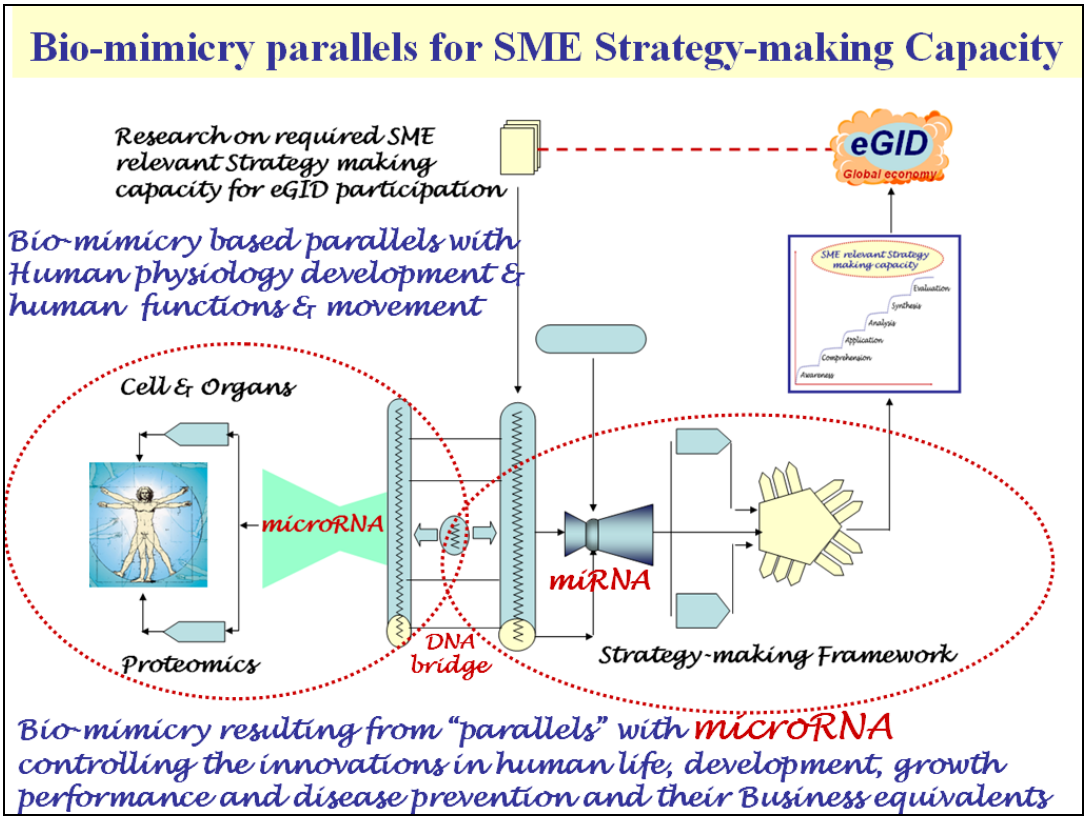


Figure 11.2 – Meta-strategy and Pathway to supervise and manage the parallel worlds of Biology and Business

Figure 11.2 also confirms the situation that the supply of the "Epistemic Catalysts" is ongoing and that new usable findings for strategy-making are being published , almost on a daily basis by the Biological world.

The Meta-strategy's potential is to transform the context, leverage the bio-synthesis lessons, reinforce the abstraction-conditions, and expand the scope of its utilization by integration with the MNC-centric resources for success with SME-world business challenges.

In Figure 11.1 for example, the epistemic lessons from epigenetic elements known as Micro-RNAs (miRNAs) show how the inclusion or omission of convergence-abstraction factors such as identity, integrity, sensitivity, mobility, etc. can make the difference between a successful eGI business ecosysstem or its failure.

In the upper right of the diagram, the pathway to eGI is illustrated as the result of the successful application / inclusion of the convergence-abstraction factors,

11.2.3 Iteractive spiral-type advancement and eGI pathway with Meta-strategy

The framework that SMEs can deploy with the Meta-strategy world specifically relies upon the use of Pre-2000 Building Blocks. These resources can be renewed and re-vitalized just as genes and individual proteins and cells are continually revitalized for nature's supply and delivery of bio-innovations. Post-2000 Biology "renewal, rejunivation and renaissance processes therefore deliver lessons on higher-level leveraging for the renaissance of MNC-centric Pre-2000 Business Models.

In Figure 11.2 for example, SMEs could apply the lessons of the Bio-world by aligning and re-framing the Pre-2000 MNC-centric example of the Prahalad Tree of core-competencies for innovation development. Old competencies and capabilities could be validated, updated and reinforced with the latest published findings of Post-2000 Biology/ Proteomics. They would offer lessons to generate new perspectives for Post-2000 SME Business-world.

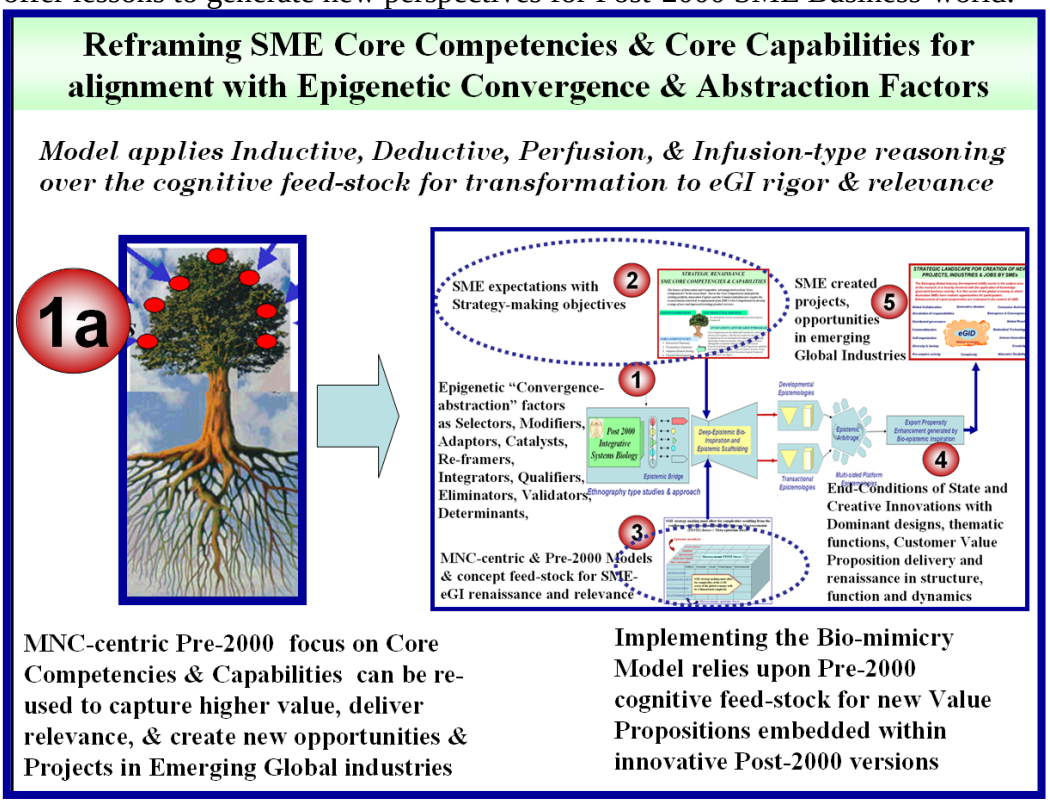


Figure 11.2 – Renaissance of Pre-2000 MNC-centric Building Blocks – Prahalad Tree

The Renaissance potential of the Epigenetic-exemplar is explained in Figure 11.2. It illustrates how the development and existence of the epistemic parallels between human biology and business systems can re-vitalize business concepts. Item 1a for example is the Prahalad model that is now over 30 years old. Prahalad's use of the metaphor tree for business strategy-making (for MNC firms in the 1980 business era) is based on the combination of core competencies to generate innovations.

The Tree-root system (Item 1a) has a direct parallel with Post-2000 understandings of Systems Biology. The proteins of the human life-form are the different products or the fruit of the tree. The innovations in the protein functionality results from the different combinations of the 4 nucleotides (A,G,T and C) which make up the DNA molecule. The proliferation and innovations in protein syntheis (business outcomes) result from the grouping and sequencing of the A,G, T and C bases which bring together the amino-acid protein building blocks.

Each cell in the human life-form contains a copy of the DNA and the combination of the cells and structures of plant in the root-zone and the rest of the plant represent the business ecosystem. The dominant issue from Systems Biology is the strategic role livered by the microRNA chemical unit that controls the production of the proteins. In most instances the microRNA protein controlling action is conducted with other proteins and delivers silencing of multiple genes and their expression of proteins.

In implementing the Resarch Project's Model (Figure 11.2) , the 30 year MNC-centric building block is re-framed to become a cognitive feed-stock (Item 2) within the implmentation process. SME strenghts in the context of the epgenetic convergence-abstration factors thereby become reinforced and value added with the similarly transformed cogntiive feed-stock (Item3).

11.2.4 Epistemic Parallel & epistemology for Model Implementation

An extraordinary level of coincidence can also be shown to exist between the management of knowledge by Nature and the required management of knowledge for SME-eGI strategy-making. These coincidences have been termed the "epistemic parallels" because of their common knowledge-base and groundin. Their scope to generate business strategy lessons is relatively unlimited becuause of the elegance and the expansive scale on which Nature manages its knowledge in the human life-form.

The full spectrum of epistemic parallels can be appreciated in Figure 11.3. The left of the diagram for example, illustrates the 2 mechanisms that jointly result in the cration of new bio-innovations. In the lower left are the genes (the generic building blocks similar to Pre-2000 strategy-making models) that are transformed by theepigenetic factors (upper left) to create new conditions of characteristic convergence and abstration. These result in the biological structures and functions shown on the left of the box on the right of the illustration.

It is the Micro-genes that exert the nano-level controls of convergence and abstration through to the macro- and meta levels in the two epistemic streams of Nature's epistemology. Direct parallels can be seen to exist alongside each of these conditions on the extreme right of the diagram. The epistemology for business strategy making therfore requires consideration of a new set of epistemic parallels or a new platform to assist in the pathway to eGI.

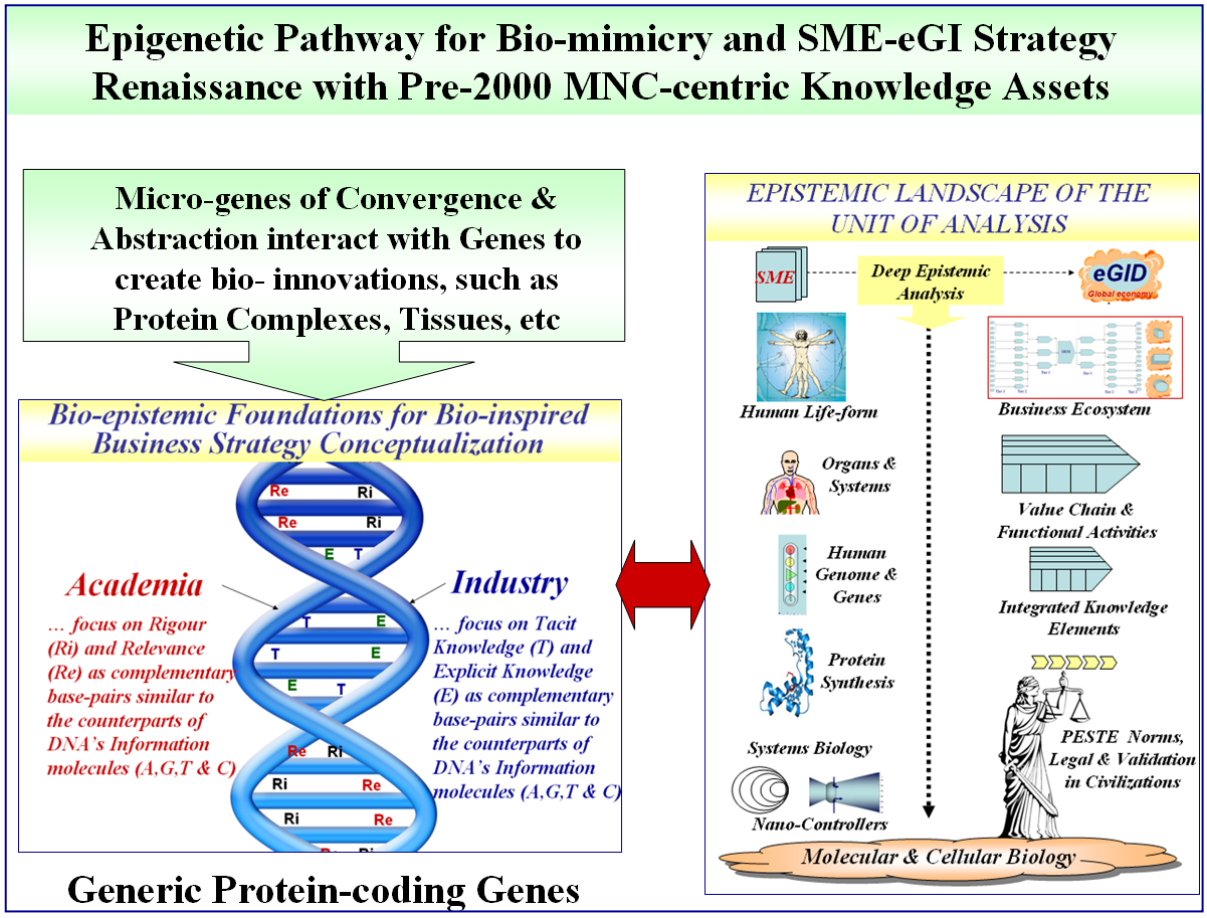


Figure 11.3 – Epigenetic Pathway to SME-eGI with bio-mimicry and epistemic equivalents for entire life-cycle of ecosystems

The intensity of the epistemic parallels uncovered by the Research Project can be likened to the parallels between the two helical strings of the DNA. The lower left corner of Figure 11.3 for example illustrates this new concept for the creation of an epistemic platform from which there can be cross flows of knowledge and information from epigenetics for SME relevant strategy making. An epistemic bridge has been effectively created to provide an innovative epistemic platform, a developmental scaffold, and a knowledge exchange system for business strategy-making. New perspective on the opportunities for innovation in the global business landscape need to be harvested from the combination and embedding of convergence-abstraction actors with the MNC-centric building blocks.

11.3 Epistemic Framing for removing "learning and utilization" barriers

The framework solution offered to the Research Questions on resolving epistemic barriers, developing learning pathways, creating usable models, and their validation therefore involve and require the building of SME "thought-competencies" with Meta-level management of

perspectives at the intra, inter and extra-domain levels for use of the Model's convergence and abstraction potentials.

Figure 11.4 illustrates the hypotheis that a parallel level of thinking now needs to be the minimum additional resource required if SMEs are able to utilize the MNC-centric resource. The existing restrictions on context-sensitivity, technological obsolescence, multi-functionality, and convergence of technologies – all can be better analyzed with the use of the bio-mimiced "Convergence and Abstraction" conditons of state.

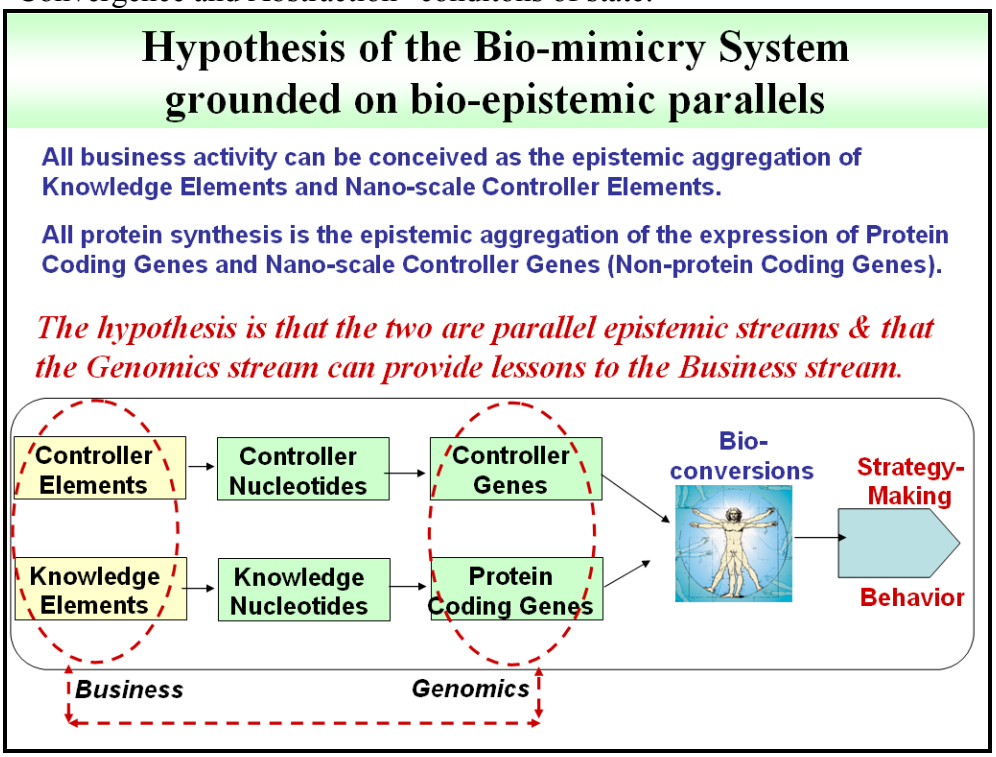


Figure 11.4 – The new Resource for SME strategy-making that removes barriers associated with MNC-centric knowledge assets

The new parallel thinking to assist SMEs is illustrated at the base of the drawing. Direct one-to-one and many-to-many relationships need to be made between the epigenetic exemplar and the planned SME strategy-making behavior chain. The parallels exist over the entire live cycle of the stategy-making behavior and in each stage, checks need to be made against the conditions of convergence and abstration that the strategy seeks to create for SME-eGI success.

11.3.1 Behavior Chain

The two parallel streams of "Epistemic Behavior" as illustrated in Figure 11.4 furtner focus on the need for SMEs to gain a better understanding of Nature's Knowledge Management and Wisdom Management processes. If SMEs are to implement the Bio-inspirational Model, they would need to develop a "Behavior – Chain" mindset of the type shown in Figure 11.4. SMEs would then identify the existence of one or more of the Epistemic Catalysts (eg, identity,

reliability, integrity, mobiligy, etc). SMEs should seek to identify or integrate one or more of these epistemic catalytic traits that may exist within the Inputs, or the Processes or the Outcomes of the "Behavior Chain".

The catalysts of convergence and abstraction may serve as the source of Customer Value Propositions, or they may function as the Dominant Design-criteria for the business ecco-system's survival, or they may be the differentiator with competitors. They could in fact be applicable to all of these conditions. The key factor however is that they are the parallel epistemic system required fro renaissance, rejuvination and innovation capture.

11.3.2 Belief Systems on dominant desgins

SMEs need to develop their Belief Systems that would enable them to actively identity the potential for convergence and abstraaction that now needs to epistemically populate in the strategy-making inputs, processes and outputs.

Without this mindset and belief system, the MNC-centric resources will remain generic and public-domain knowledge, just like their Protein--coding gene equivalents. SMEs need this Belief System that actively seeks to embed and operationalize strategic-differentiators scuh as identity, inegrity, sensitivity, relaiblity, mobility, etc.

11.3.3 Thought Acquisition and Signal Interpretation are markers of eGI

If SMEs can develop their Belief Systems for the unification and renaissance of common knowledge, they would be well positioned to differentiate themselves from competitors and gain insights into the needs and dynamics of eGI. This is because eGI is of itself a business landscape that follows the same mechanisms. Goods and services offered in eGI are embedded with characteristics that acquire competencies, interpret customer needs, and integrate systems that contain dynamic convergences and abstractions. eGI delivers the dominant designs that are characterized by Nature's exemplars within their inputs, processes and outcomes. Essentially all resources, irrespective of their status in the production stage of life cycle are characterized by their "dominant design".

SMEs are well positioned to develop strategy-making frameworks by integrating the concepts of the Epistemic Catalysts, the Dominant Design, the Behavior Chain and the Behavior Mindsets.

11.3.4 Epistemic Grid for Model implementation with Discipline crossing

Nature's porfolio of convergence-abstraction exemplars offer further support for SMEs to make use of MNC-centric resources that invovle cross disciplines. Strategy-making plans that involve both developmental and transactional systems can benefit from the characterization of their respective inputs, processes and outputs. The portfolio of conditions of state of visibility, mobility, duality, etc., can assist in identifying the dominant design or function of Pre-2000 or Post-2000 resources. The identification and use of the convergence-abstraction controllers,

signals, markers and validators, etcand the potential that can be achieved by SMEs with a Grid-management type approach illustrated in Figure 11.5.

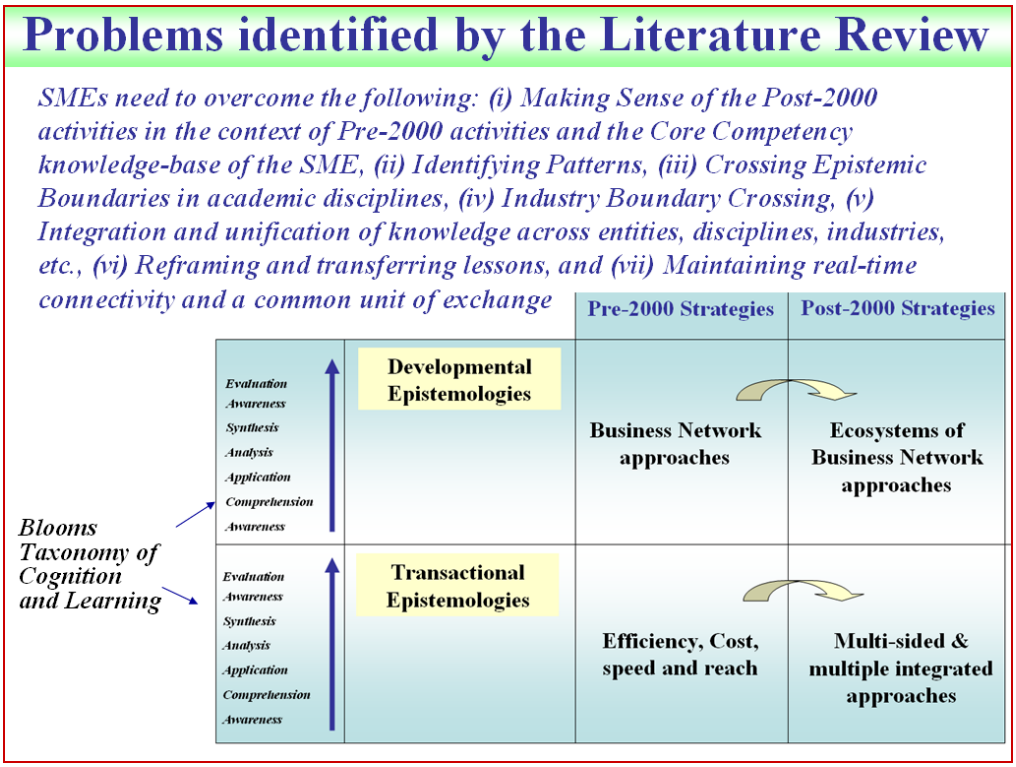


Figure 11.5 Grid-management approach for SME stratgies that can cross academic disciplines

Essentially the Grid enables SMEs to identify or characterise all inputs, processes and outcomes in relationship with the 4 quadrants of the diagram. The new Post-2000 focus for SME convergence management is on the extreme right quadrants involving business ecosystems and their engagement in the transactional or developmental activitives required for strategy-making.

Renaissance and new innovations are also possible with the epistemic embedding of the convergence-abstraction exemplars to make the ecosystem complexes and offerings to eGI.

11.3.5 Generative Capacity and Export Propensity enhancement

The convergence – Bio – inspired Model and its portfolio of epistemic catalysts (eg the emergent conditions of Affordability, Identity, Contiguity, Conformity, Visibility, Purity, Traceability, Singularity, Versatility, Mobility, Maturity, etc) appears to offer SMEs unbounded potential to enter new markets, geographic territories in addition to being able to cross technological boundaries and business and scientific disciplines.

The Model's implementation and its use of the convergenc-abstraaction methodology simply seeks to identify the existence of the convergence potential or the emdedding of missing elements to make up the thematic chains of integrity, mobility management, versability landscaping, etc.

Problem Analysis – Factors to evaluate the potential for an epistemic exemplar with Generative Capacity for Export Propensity Enhancement & SME strategy-making	Human Systems Biology	Environmental Ecologies	Natural Physics	Complex Adaptive Systems
Total Life Cycle framework	√	?	?	?
Production Platforms	√	?	?	?
Technological Platforms	√	?	?	?
Fulfilment Platforms	√	?	?	?
Production Chains	√	?	?	?
Fulfilment Chains	√	?	?	?
Modules & Corporate Entities	√	?	?	?
Development Cycles	√	?	?	?
Business Ecosystems & Collaboration	√	?	?	?
Business Models	√	?	?	?

Figure 11.6 – Comparison of the Bio-exemplar's potential to exceed other subjects of learning

Figure 11.6 offers a further perspective on the potential fo the Bio-epistemic exemplar to far exceed the learning potential and the value delivered when the bio-epigentic system is compared with other candidates. The left column for example lists the range of activities that need to be managed in an export focused strategy-making exercise. Each of its chains or functional activities need to receive lessons on strategy making. When this criteria is compared to other candidates that have been generally accepted as being able to offer lessons the result is a series of question marks. The overriding capacity of the bio-epistemic landscape and its capacity for learning and connectivity therefore confirm its position as the unit of exchange and the unit of analysis for SME engagement in the creation of new businesses and new indsutries.

11.4 Epistemic Framing for Convergence-abstraction Catalysis

This section presents the range of scientifically based information that would both support the basis for the Bio-inspired Model as well as assist SMEs with the actual implementation of the Model. Strategy-making lessons from the Model are grounded on managing the convergence-abstraction mechanisms that can integrate Pre-2000 and Post-2000 sources of knowledge in the scientific domains of Epigenetics, Genetics, Proteomics and Proteome-bahavior.

The upper section of Figure 11.6 illustrates the Proteomic-behavior chain resulting from the cascading action and applications of the epigenetic convergence-abstraction factors.This is Nature's "Rules of the Game" for bio-psychiological and bio-pathological outcomes. Their parallels for strategy-making are illustrated in the lower section of the drawing.

11.4.1 Behavior lessons fromConvergence-abstraction Catalysis

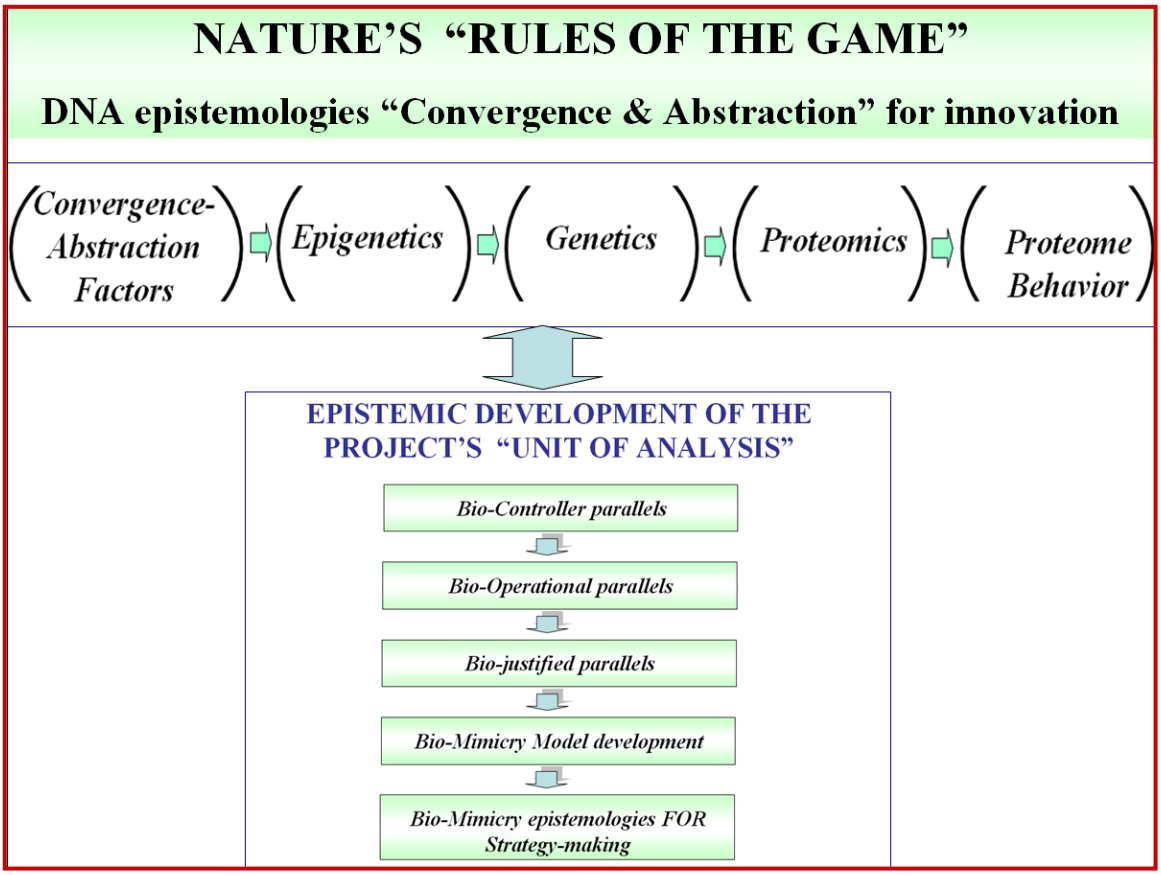


Figure 11.6 Nature's Rules of the Game - Correlates of the DNA-exemplar for Model implementation

Figure 11.6 and 11.7 provide further justification and true belief of the Model's scientific grounding and the scope for successful implementation. Reports on the successes being achieved with each of the scientific disciplines of Figure 11.6 and 11.7 are a daily feature of the scientific, business and mass-media and press.

Accompanying each of their discoveries are descriptions of the active chemicals, mechanisms, or intermediates that are involved in the required bio-epistemic convergences at the nano, micro and molecular levels of their published innovations.

Scientific basis & grounding for the Supply of Lessons for Model Implementation from dynamics of Convergence-Abstraction Factors

The Post-2000 era of Systems Biology currently utilizes the most modern of instrumentation and technologies for sensing, imaging, chemical analysis, activity recording, screening, in-vitro and in-vivo experimentation, etc. for understanding, sense-making and utilizing the proteomic transformations, transactions, developments, etc., as required in a number of industries and applications.

All of these findings however are directly related to the influences and interventions made by the epigenetic Convergence-abstraction factors, either as initiators, catalyzers, controllers, end-conditions of state, and/or dynamic determinants of activity.

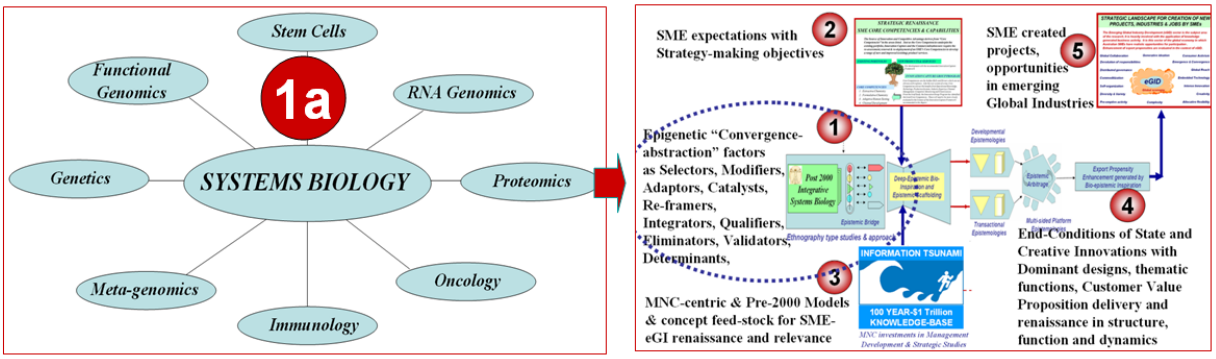


Figure 11.7 Source of convergence-abstraction concepts for use in Model Implementation

Figure 11.7 illustrates the scientific sub- disciplines that together make up the new discipline of Systems Biology. Their aggregation into the unified study of Systems Biology is justified by and it confirms their common epistemic heritage of the Convergence-abstraction factors.

Nature's Knowledge Management System is at work in each of the sub-disciplines through the common DNA-master file information molecule in every cell of the human body, irrespective of the functions of the cell. Stem Cells for example are the generic starting form of all functional cells and by differentiation the stem cell is converted into functional cells needed in tissues, organs, and central anatomical systems. Functional genomics is involved with the science of using the cell's DNA to provide instructions and receive instructions in the form of sequences of the epistemic conditions of state represented by the nucleotides AGTC. The instructions issuing out of the cell's nucleus provides lessons from RNA genomics and Proteomics on how Nature's Knowledge Management System transforms the positions of the AGTC epistemic conditions of state into protein products. Other sub-disciplines off the diagram are similarly reliant upon Nature to transform its AGTC information code to assemble the amino-acid building blocks into the made-to-order proteins, in a real-time mode of demand management.

Research reports and analysis of the underpinning factors and their dynamic Convergence-abstraction mechanisms (Item 1a in Figure 11.7) will continually provide strategy-makers with

new and innovative concepts that need to be introduced into the Pre-2000 models for renaissance and innovation.

11.4.2 Hierarchical structures and transaction management for Model's convergence-abstraction implmentation

The implementation of the Model is offered further support by harvesting lessons from Nature's processing of knowledge. This takes place from the nano-scale to the ultra levels that are visible to the human eye. Proteomics for example are responsible for the development and functioning of cartilage and tissues that form functional shapes and connectivity for dynamic action. Stem cells seeded into these structures and fed by nutrients, growth factors and the cardiovascular finds result in their proliferation. Organs so formed are the basis for the Post-2000 promise of Regenerative Medicine. The epigenetic factors of human life-form building are therefore available as lessons for business building.

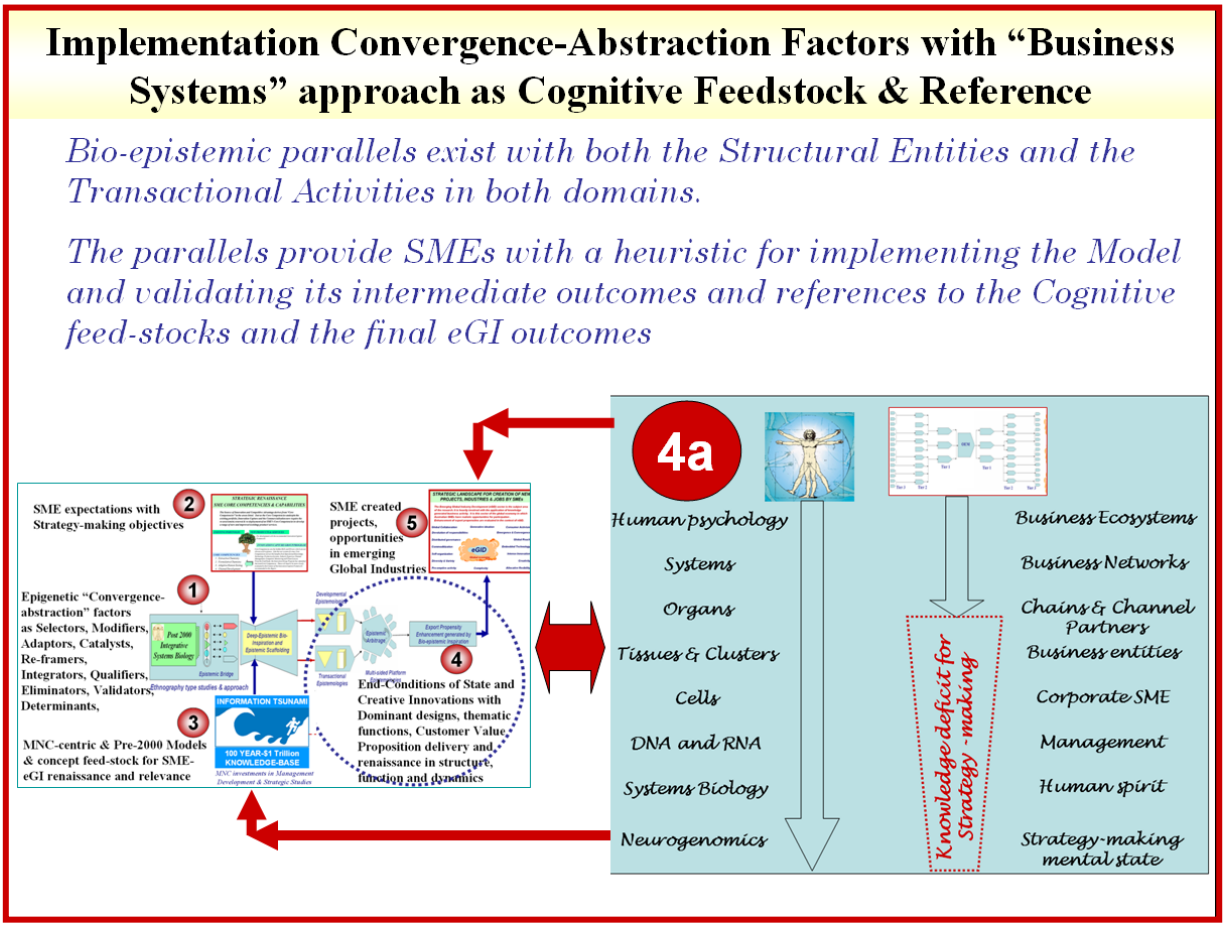


Figure 11.8 Lessons to implement the Model's developmental, structural, transactional and innovative outcomes

Figure 11.8 illustrates on the right, the hierarchical structure of neuro-genomic activities that involve physical matching between Nature and business domains. In almost every heirachial level parallels exist for implementing the Model. Item 4a for example and its hierarchy offers

lessons for structural development and transactional lessons, when the convergence-abstraction factors are applied.

On the right – side of the diagram are the entities that may be needed in a strategy-making challenge. Pre-2000 and Post-2000 recommendations, theories and assumptions are best evaluated and thus selectively incorporated.

11.4.3 Epistemic uplifting and knowledge gap decrement

The dominant mechanisms of the Bio-inspired Model are characterized by the selective and functional integration of the convergence – mediated epistemic catalysts of all knowledge resources available to SMEs, their business ecosystem membership and that of all stakeholders. Figure 11.9 provides the framework in which the knowledge base available to the SME has been found to be at an increasingly lower level relative the knowledge driving the Post-2000 global business landscape.

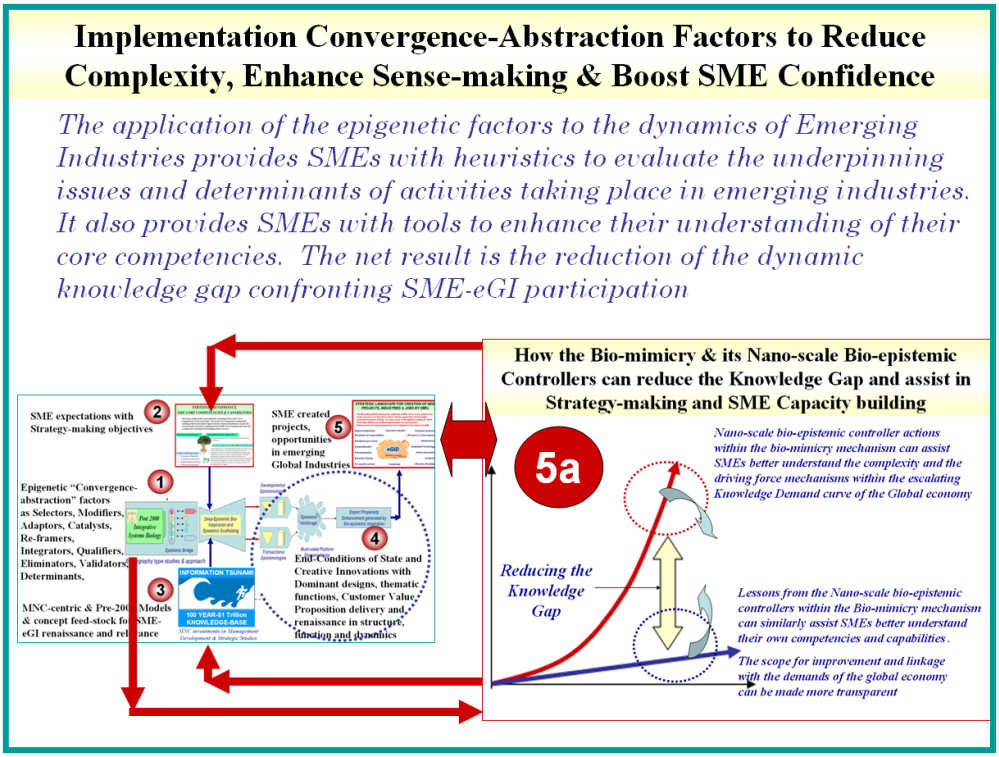


Figure 11.9 Knowledge gap reduction mechanism by the Model's application of epigenetic factors

The Model addresses this differential by using:

(i) The embedding of the epistemic catalysts within the SME knowledge base, and within the other epistmic resources, as illustrated in Figure 11.9. In each case the embedding and the framework creates a better understanding

(ii) The embedding of the catalysts within the end-structures and strategic outcomes being developed (Item 5a) to thereby achieve an enhancement as well as a better level of confidence in the rigor and relevance of the eGI-destination outcomes, and

(iii) The embedding of the same epistemic catalyst portfolio to identify and visualise functional activity – patterns in eGID, and to thereby lower the relative superiority of the demand curve.

The net result is that the Model's use of its Epistemic Catalysts can reduce the growing knowledge gap in favour of SME strategy-making.

11.4.4 Ascent Routines

In Chapter 5 barriers presenting SME eGID participation were identified in the context of the Ascent Routines exemplified in the Bloom's Taxonomy.

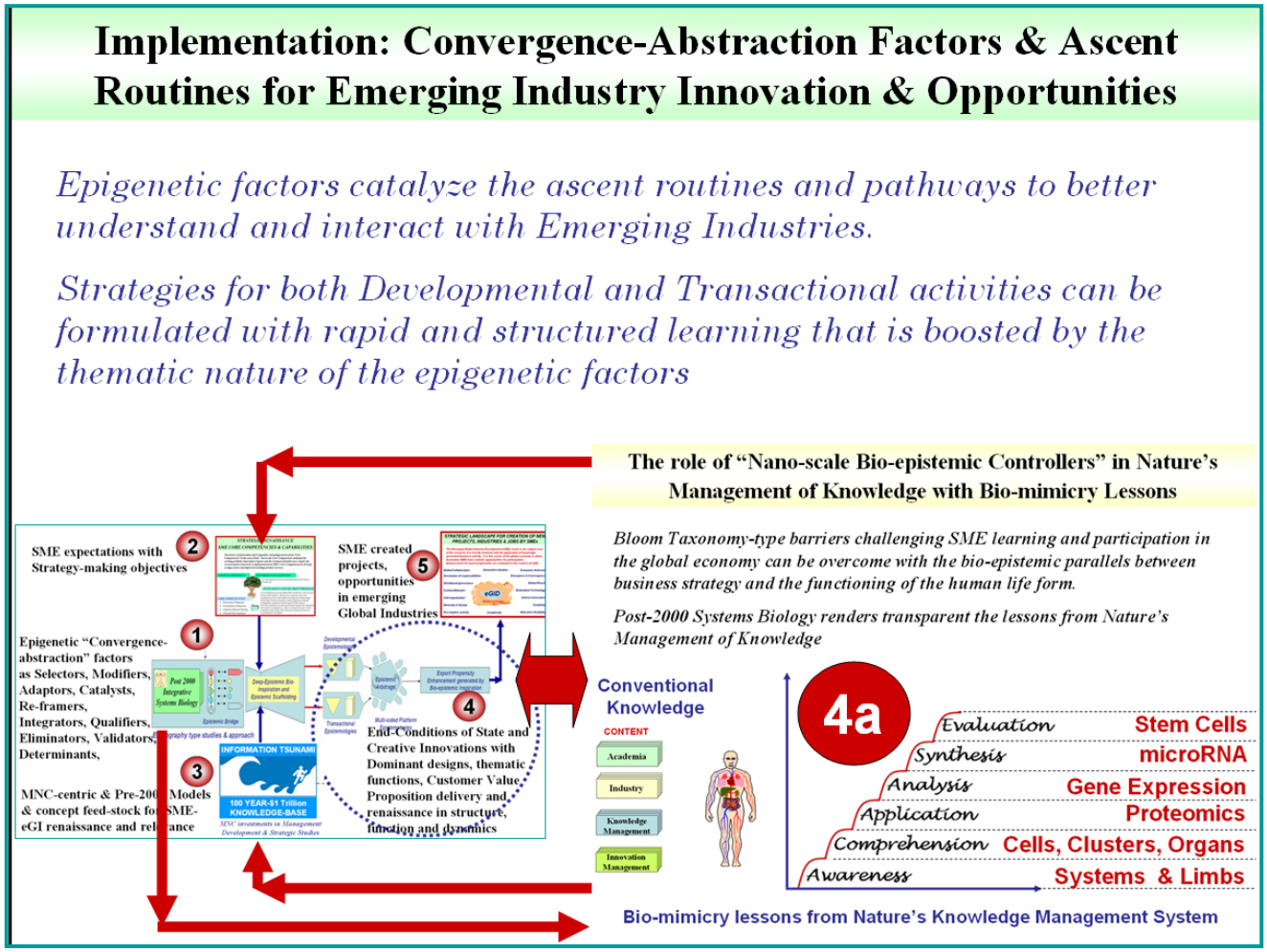


Figure 11.10 Implementing epigenetic factors to catalyze and accelerate Ascent Routines

SMEs capacity can deploy the Model's entities with each of Ascent Routines as illustrated in Figure 11.10. The role of bio-mimicry factors in rendering transparent the lessons from Nature's

Management of Knowledge, can be applied to the Ascent Routines (Item 4a) in multiple areas within the Model.

SMEs are challenged by using the conventional knowledge from 100 years of business strategy studies. Item 3 issues within the Model for example, can be better understood and mastered by combining the epigenetic factors witht eh Bllom learning heirarchies. By using Post-2000 research in Systems Biology it is possible to learn from an expanding range of epistemic parallels that are being generated almost on a daily basis, at the molecular and cellular levels. The key issue is that the broad awareness of human physiology can provide the platform for using the Systems Biology research to advance strategy-making capacity to the high order thinking and levels of the Bloom's Taxonomy to all of the elements within the Model.

All that is required is for SME strategy-making behavior to adopt a "Meta-level" approach, relate the strategy-making entities to Nature's correlates, transfer the lessons available, and achieve the new perspectives and tools for innovation.

11.5 Epistemic Framing for Convergence-Abstraction Outcomes and emergence

The case is argued that the success of SME-eGID strategy–making outcomes is directly related to the Meta-strategy approach requiring active embedding, integration, and application of the epigenetic factors within:

(i) The SME knowledge-base and its core competencies and capabilites
(ii) As above for the entire membership of SME-led business ecosystems, jointly developing strategies for emerging industry success
(iii) The full life cycle of strategy making, especially at the very start of the process
(iv) The intermediate and end-condition states of strategy-making, as aZ validator and assessment of rigor and relevance to the emerging idnustry needs being targetted
(v) the full portfolio of epistemic resources and specifically the MNC-centric models and concepts
(vi) the issues of learning and Ascent Routine navigation with the Bloom Taxonomy,
(vii) the factors contributing to the current knowlege gap differential, and
(viii) better understanding of the epistemec – dynamics of eGID.

Figure 11.11 and Figure 11.12 illustrate how the Model's multiple components require total cognitive immersion within the bio-epistemic exemplar. For example in Figure 11.11 lessons from epigenetic research studies with micro-RNAs offer a new range of resources for convergence-abstration fit for r SME strategy-makking and integration.

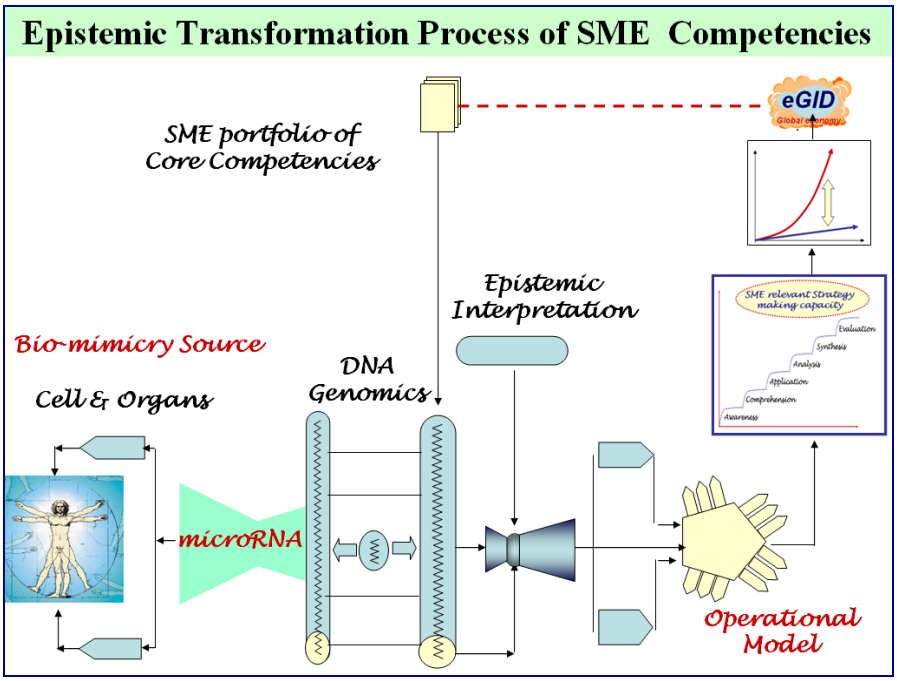


Figure 11.11 DNA-based Epistemic Bridge for Knowledge and Wisdom transfer for SME business strategy-making

The left of the diagram illustrates the supply potential and transfer of lessons from systems Biology. In the centre is the Pre-2000 Building Blocks. On the right of the digram is the integration tasks and the connection with the eGID challenges.

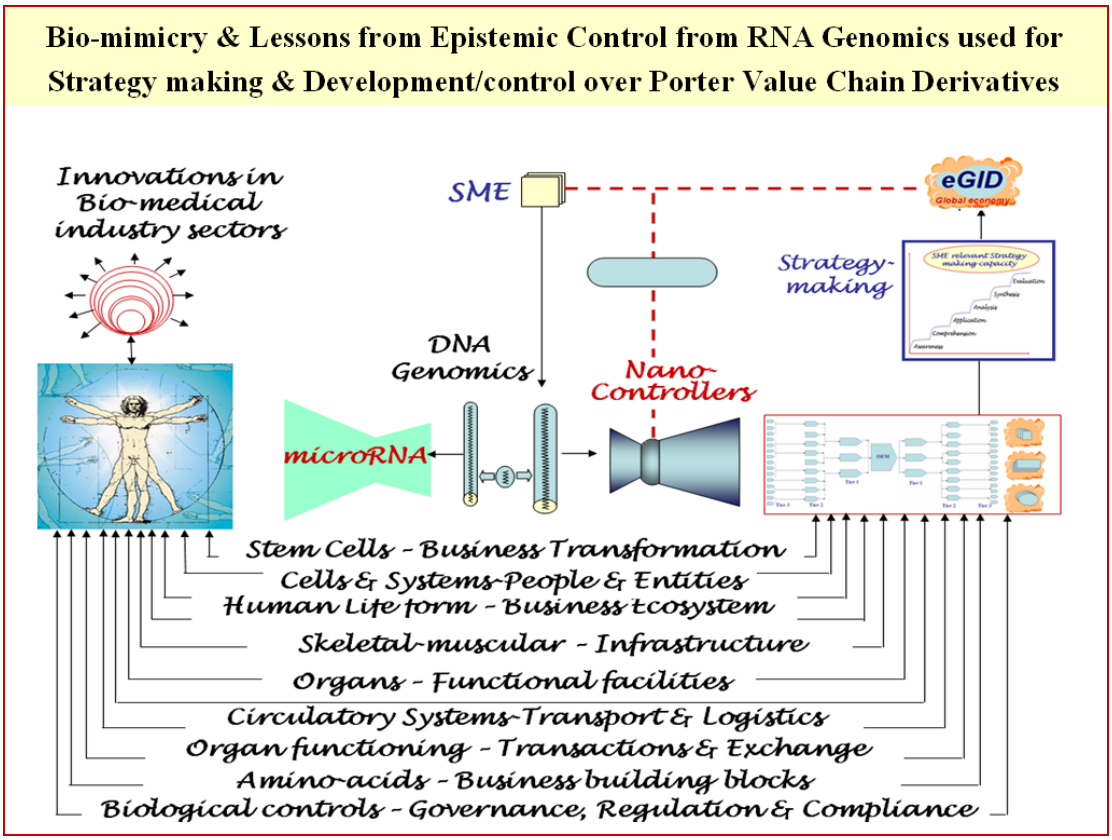


Figure 11.12 Detailed Mapping of Epistemic Parallels to utilize DNA epigenetic lessons for SME strategy-making

SME succeses with the Model requires relatively low level of knowlege of the system Biology entities. Indeed it is argued from the viewpoints illustrated in Figure 11.12, that even an "awareness" level of knowledge of entities can deliver higher level lesson application for strategy-making.

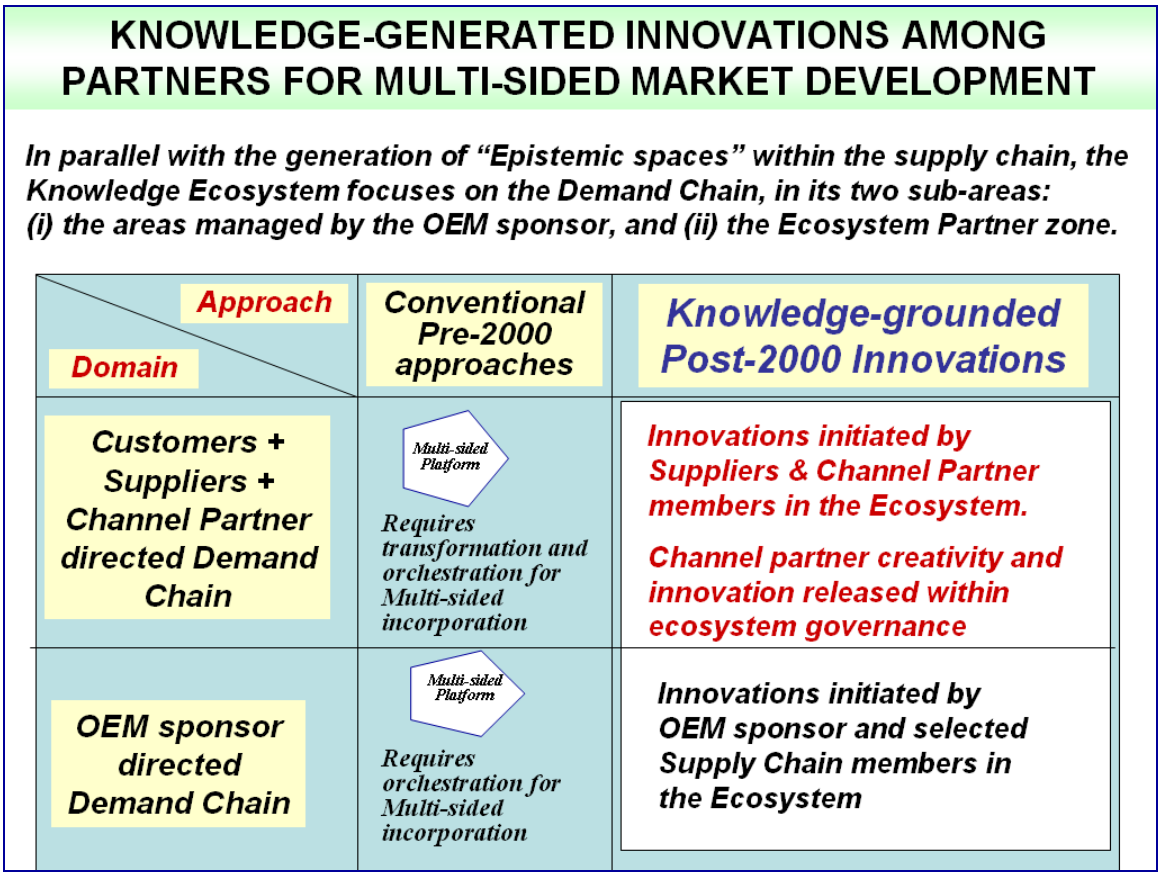


Figure 11.13 Expanded SME-eGI landscape for implementation with bio-inspired Convergence-abstraction catalyzers to achieve strategy-making renaissance

11.5.1 Leveraging low level knowledge of the Bio-epistemic metaphors

The Meta strategy's focus therefore only requires base level knowledge of:

- DNA
- Proteins
- Cells and tissues
- Organs and biological systems.

This level of knowledge can be used to sufficiently interpret the reports on how the 98% DNA segment is controlling the 1.8%.

11.5.2 From simplicity to manage complexity

It is argued that SME strategy-making can then apply Nature's catalytic correlates into the Pre-2000 frames and Business strategy-making concepts. Figure 11.13 for example presents the challenges and outcomes facing SMEs on the right of the diagram. By adopting the embedding of the Epistemic Catalysts of the Bio-inspired model within the segmented basic level systems (illustrated in the left of the digram) the transformation and enhancement can be attained.

11.6 Conclusion

The Chapter has presented the case where the SME knowledge base can attain and navigate the epistemic "ascent routines" for SME-eGID participation. The thesis of the Model is that SMEs need to position themselves in a mindset with a "Meta-strategy" approach. From this position SMEs can systematically and in a controlled manner access and utilize the lessons from Systems Biology.

The level of required knowledge in Biology is relatively minimal, and needs to be at the "Awareness" level only. From here the Meta-strategy would establish the correlates with their Pre-2000 strategy-making knowledge equivelents. The managed convergence and abstraction of epistemologies are therefore underpinned by the Meta-strategy related competencies to segment the measured approach and in an iterative manner build the knowledge base.

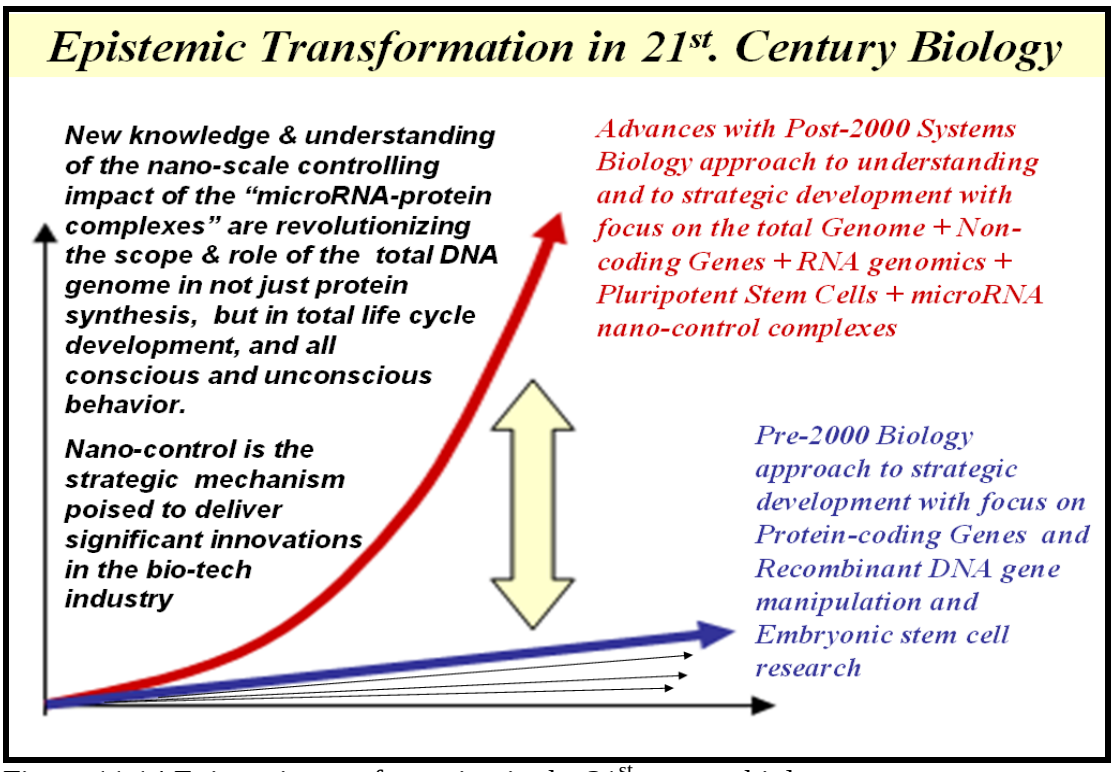


Figure 11.14 Epistemic transformation in the 21st century biology

The dissonance in the resource-positions of MNCs and SMEs and the differences in their relative proximity to eGID can indeed be managed by the Model's Meta-strategy's capacity to:

(i) Supervise and control the deployment and embedding of the Epistemic Catalysts (of mobility, identity, integrity, versatility, proximity, agility, etc) in the Pre-2000 building blocks with which SMEs are familiar

(ii) Harvest the unbounded source of lessons from Systems Biologyby adopting Meta-level management over the two parallel worlds of Biology and Business, and

(iii) Develop a mindset for "whole of life" epistemic embedding them limiting the use of the Epistemic Catalysts to a "End-of-Pipe) conditional selectivism.

It will only be through the combination of the subsets and support systems of the Model and its Meta-management protocols that the dynamics of the knowledge gap illustrated in Figure 11.14 can be transformed.

11.7 Chapter Summary

We approached Chapter 11 with the development of a Bio-inspired Model and we sought to determine if the Model's elements and segments could be developed into SME usable frames for implementation. Specifically the Chapter focused on the Research Question on whether such frameworks could be utilized and implemented despite the relative disadvantages of SMEs whne compared to MNCs and the need to utilize MNC-centric resources in the SME quest to participate in the Post-2000 global landscape.

The challenge of the Research Question on the framing competency requirement is relevant because almost all of the Pre-2000 building blocks required for use with the Bio-inspired Model application are of, by, and for MNC participation in eGI..

In this Chapter we have demonstrated how the use of the concepts of parallel worlds of Business-strategy and epigenetic-Biology can indeed overcome the SME structural disadvantage. The series of Meta-strategy protocols and support systems (for the implementation of the Bio-inspired Model) that have been presented require a parallel Learning system. It is in this context that we approach Chapter 12 to determine (per the second Project Research Question) if SMEs can achieve the required learning.

Essentially Chapter 12 will seek to explain how the required knowledge of Model's elements and its epigenetic equivalent support system can be harvested in a structured manner.

CHAPTER 12 BIO-INSPIRED BUSINESS MODEL VALIDATION

12.0 Introduction

This Chapter focuses on whether a Learning Management System or frameworks could be developed to enable the SME to utilize the Bio-inspired Model for Post-2000 global business. In Chapter 10 we developed a Bio-inspired Model and in Chapter 11 we presented a range of epistemic scaffolds and supporting frames required to implement the Bio-inspired Model. It is in this context that we respond to the Project's second Research Question on determining if the Model's required infrastrucure can be leveraged into a Learning Management System for eGI-relevant capture. Figure 12.1 illustrates how the Model is tested against the seminal stratgy-making critera developed by Professor Peter Singe of MIT and the Fifth Discipline of the Learning Organization.

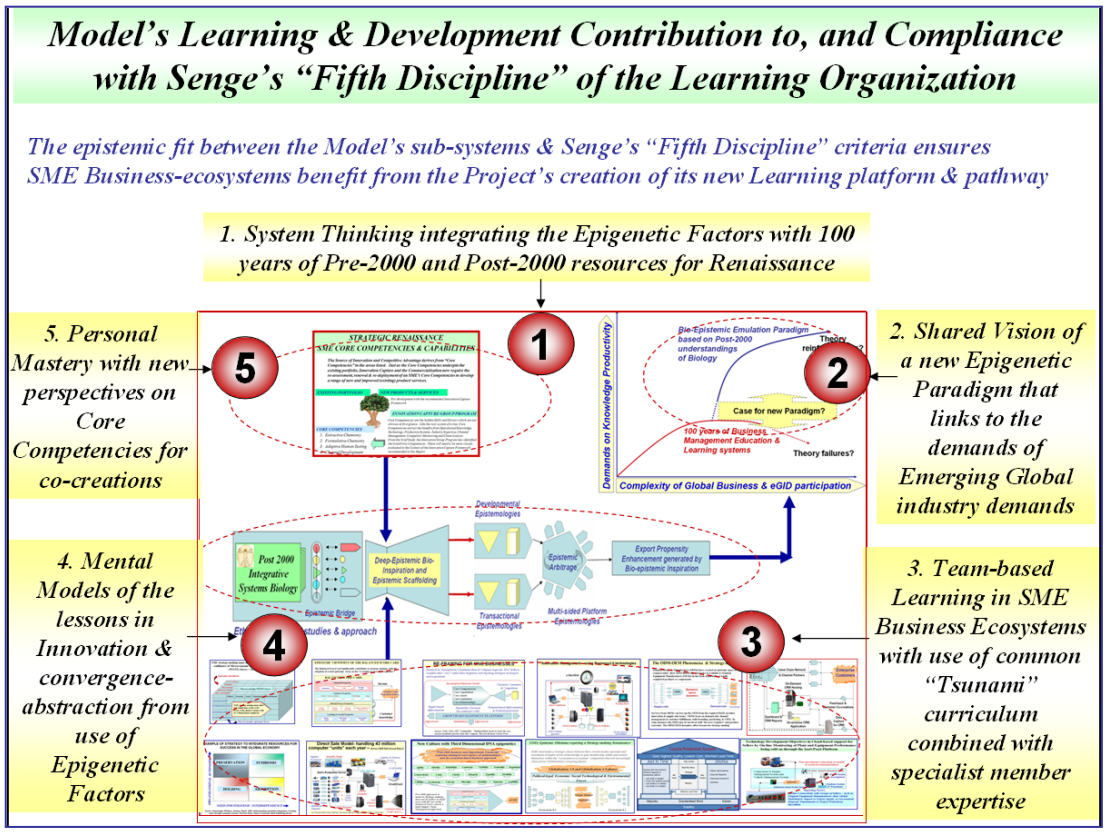


Figure 12.1 Testing the Model for its contribution and functioning as a Learning Platform and Process

In responding to this Research Question, the Chapter subjects the Model's sub-systems to the Fifth Discipline criteria, The Chapter concludes that the epistemic fit between the Model and the 5th Discipline overcomes the learning barriers faced by SMEs who are at a relatively disadvanted position in using MNC-centric resources. The Model also addresses barriers such as the lack of SME proximity and pathway options to succeed in Post-2000 global business. To overcome this

dissonance SMEs need to create and manage joint participation within business ecosystems. The epistemic fit confirms that the Model and its Learning System infrastructure would equally apply to the unit of Analysis as being for a SME or a business ecosystem.

12.1.1 Unit of Analysis for Research Question

The Bio-inspired Model is underpinned by a number of epistemic concepts that support each other in an iteractiveand integrative manner before the full strategy-making innovations can materialise. The unit of Analysis for the Research Question is therefore the required development of a Learning Management-type System that is usable for SME-eGI innovation capture.

12.1.2 Aggregates of the Unit of Analysis

The Bio-inspired Model seeks to utilize its portfolio of Epistemic Catalysts (of Convergence-abstraction) by embedding them within the Pre-2000 and Post-2000 building blocks for renaissance of past knowledge and transformation into disruptive or constructive innovations. The challenge for the Model and the Learning Management System is that the aggregation of the building blocks (largely created by, of and for MNC contexts) will first require de-construction, de-contextualization, and removal of source confusion, focus-confustion and the creation of new interfacing and re-framing, etc., before embedding them for SME-business ecosystem learning and development.

12.1 Definition of Terms and Concepts used in this thesis

Epistemic Learning Management system – is defined in the context of the required approach for ecosystem members to utilize the catalytic potential of the Bio-inspired Model for innovation strategy-making capacity development.

Bio-inspired Model – is defined in the context of applying Nature's Knowledge Management system for the development of strategy-making knowledge.

Nature's Knowledge Management System – is defined in the context of the manner in which Nature creates, develops and transacts its bio-synthetic-fulfilment operations over the entire life cycle of the human life – form.

Bio- epistemic Convergence Management – is defined in the context of being one of Nature's Knowledge Management mechanisms that seeks connectivity between all of the required bio-entities so as to create the required bio-fulfilment outcomes.

Epigenetic Factors are defined as the portfolio of abstract-nouns that have been identified for being embedded within strategy-making building blocks, crameworks and sub-models for the development of new and innovative strategies

Epistemic spectrum – is defined in the context of the connectivity mechanisms that include and are scaled up from the nano-scale to the mega-level that is visible.

Meta-strategy – is defined in the context as the supervisory system required to embed the Epistemic Catalysts from the Biology discipline into and for enhancement of the Business – strategy building blocks.

Epistemic Parallel worlds – are defined in the context of their common epistemic heritage (in DNA) and the parallel development in bio-epistemic working of human psychology and business strategy making.

The Fifth Discipline – is defined in the context of a Learning Management system that has been proposed by MIT Professor Peter Senge as a structural framework for knowledge capture and learning within business groups or entities within ecosystems.

12.2 Bio-inspired Model's resolution to Research Question on Learning System for Convergenc-Abstraction Lesson Capture

The Research Questions focus on Learning challenges can be translated into challenges of understanding and learning the embedding of the epistemic building blocks within the Model and its supporting protocols.

Figure 12.2 illustrates the Model's nano-scale underpinnings and their epistemic scale-up potential to generate convergence-abstraction lessons and epistemic catalysiss to achieve renaissance and become manifested within innovative strategy-making.

On the left of the diagram for example, the epigenetic interactions taking place inside the nucleus of the cell (ie within the DNA molecule). These interactions (resident within the 98% segment of the DNA molecule) are the initiators, transformers, controllers, arbitrators and mediators of the bio-epistemic messages expressed by the "public-domain" protein-coding genes. Variations in their innovative representaions as different types of proteins (even created or sourced from the same genee-bank) confirm the epistemic power of the convergence-abstraction mechanisms being propsed for the parallel creation of new and innovative strategies for SMEs.

The rapid pace of developments taking place in the science of Post-2000 Biology is clearly attributed to developments taking place in the use of epigenetic factors, markers, and their non=protein coding genes. The case is argued here that if a domain as complex as the science of biology can be transformed by the use of epigenetic factors, then surely the application of lessons from the epigenetic factors must be of value for strategy-making, since strategy-making is itself a tiny sub-set of the biology of behavior.

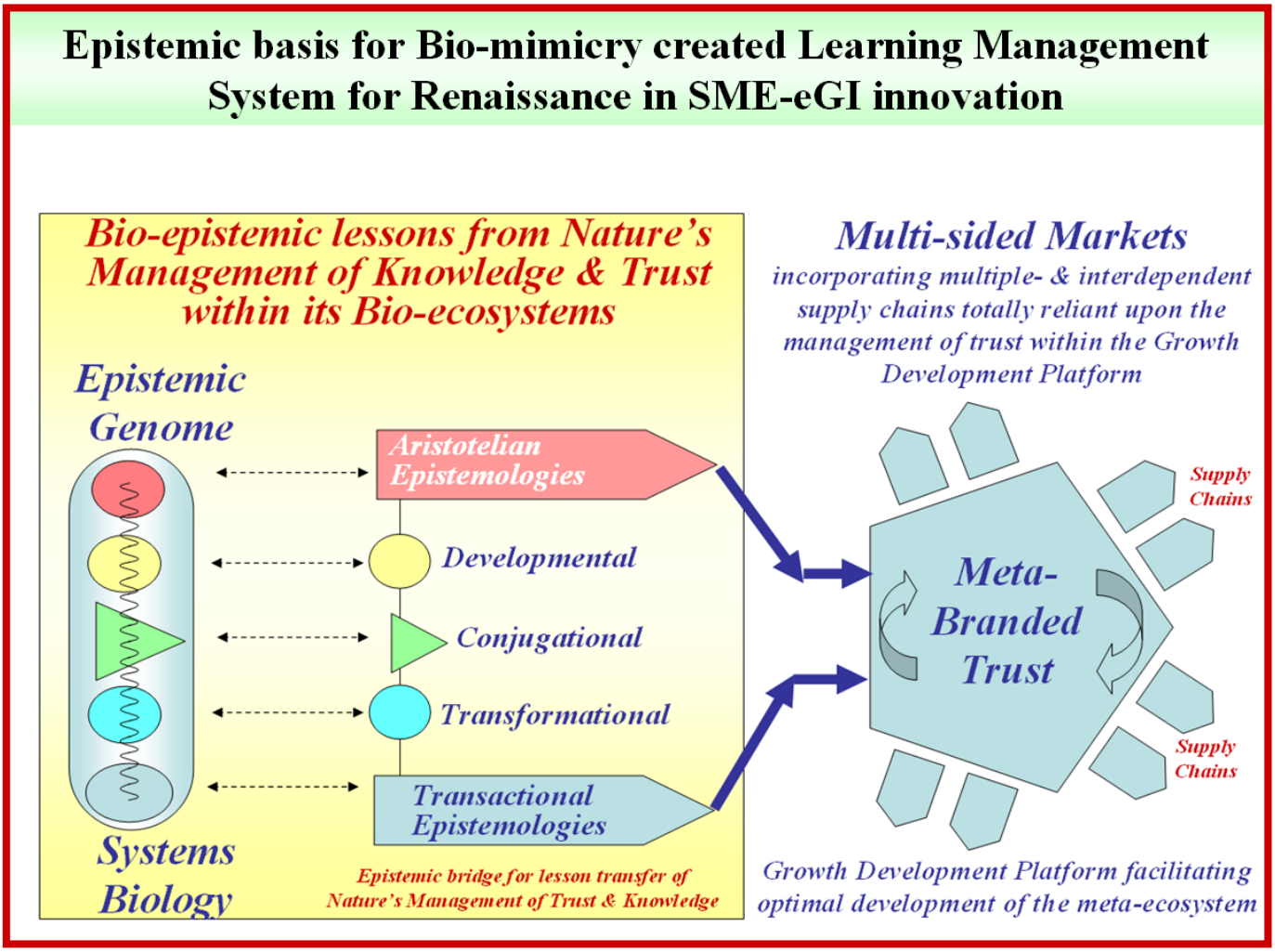


Figure 12.2 The nano-scale basis for innovation and renaissance in SME-eGI strategy-making

The middle of the diagram illustrates the 5 areas of transactional and developmental "lesson accceptors" from the bio-epistemic "lesson-givers" with convergence-abstraction entities being the unit of exchange. Both transactional and developmental biology are dependent upon the conjoining of new, innovative, and "renaisssance" shapes with these convergence-abstraction units of exchange.

The extreme right of the diagram seeks to illustrate the poential for the Model to function as an epistemic platform for the renaissance of the new, modified, adapted and transformed entities. Lessons from the DNA molecule therfore also involve the use of their progressive nano-scale conjugations up to and including the development and functioning of organs and systems.

12.2.1 Dynamic aggregation with Convergence-abstraction

Epistemic conditions of state involving thematic epistemic manifestations of agility, clarity, identity, reliability, mobility, unity, integrity, etc are used in the upward and side-word aggregation and functioning of all business concepts, entities, and schemas.

The correlates of the biological "feed-stock" entities (eg. genes) are the MNC-centric Pre-2000 and Post-2000 strategy-making building blocks. These are the targets for the epistemic renaissance.

The correlates of the biological embedding processes are the embedding of the convergence-abstraction entities.

Finally the correlates of the Nature's life-cycle reprsentations are the strategic renaissance and innovative transformations of the MNC-resources. The embedded-aggregated MNC-centric feed-stock becomes the new SME strategy-making building blocks that exhibit the dominant characterictics of clarity, identity, integrity, mobility, plurality, visibility, etc.

12.2.2 Catalytic transformation of Pre-2000 concepts for Learning

Figure 12.2 also illustrates a Learning Framework for the creation and development of Learning outcomes resulting from the dynamic embedding of the correlates of Nature's 98% DNA control mechanisms

Pre-2000 building blocks such as the concept of Multi-sided markets for example, can be innovatively transformed by embedding defining characteristics. It is argued that the embedding is essentially a value-adding transformation of the MNC-centric building blocks in the entire supply chain. The new defining characteristics are of best value when they are integrated within the entire live-cycle, from epistemic conception through to the delivery of customer value prepositions. This represents the challenge for a bio-mimicry based Learning Management System.

12.3 Senge's Fifth Discipline on Learning Convergence Management

The Project has selected the Learning System approach and conceptuality developed by MIT Professor Peter Senge as the test–criteria for the Project's Research Question. The aim is to obtain a determination if SMEs can learn to utilize the Bio-inspired Model as a Learning Management System, despite the relatively disadvantaged position from which SMEs will need to obtain learning fulfillment.

12.3.1 The Fifth Discipline for Model testing

Senge's 1990-era thesis on the need for "The Fifth Discipline" with its learning focus and structure is a further creation within the MNC-centric repository of Pre-2000 strategy-making frames. It is however generally transformable to an SME-eGI context because of its inherent conformity and emphasis on Knowledge Management and shared learning. Senge's arguments continue to remain valid despite its 1990-era debut. Senge's theories or concepts have withstood

the challenges of time largely because they cover a comprehensive range of modalities for learning.with a learning structure and a system for the progressive capture of the outcomes of learning processes.

12.3.2 Applying the Learning Criteria to the Model

In this context the Bio-inspired Model and its supporting protocols need to be subjected to the Senge Criteria as follows:

(i) System Thinking availability (Item 1 in Figure 12.1)
(ii) Shared Vision (Item 2)
(iii) Team Learning Productivity (Item 3)
(iv) Mental Model capacity (Item 4), and
(v) Personal Mastery applicability (Item 5)

12.3.3 Methodology Proposed

The methodology to test the Model as a learning platform is illustrated in Figure 12.1. Each of the Model's components (Items 1 to 5) are effectively direct correlates of the learning criteria developed by MIT Professor Peter Senge.
The Research Question will apply the Senge's Learning Criteria to determine if the Model's epistemic underpinnings are compatible with the learning requirements in the 5 listed categories.

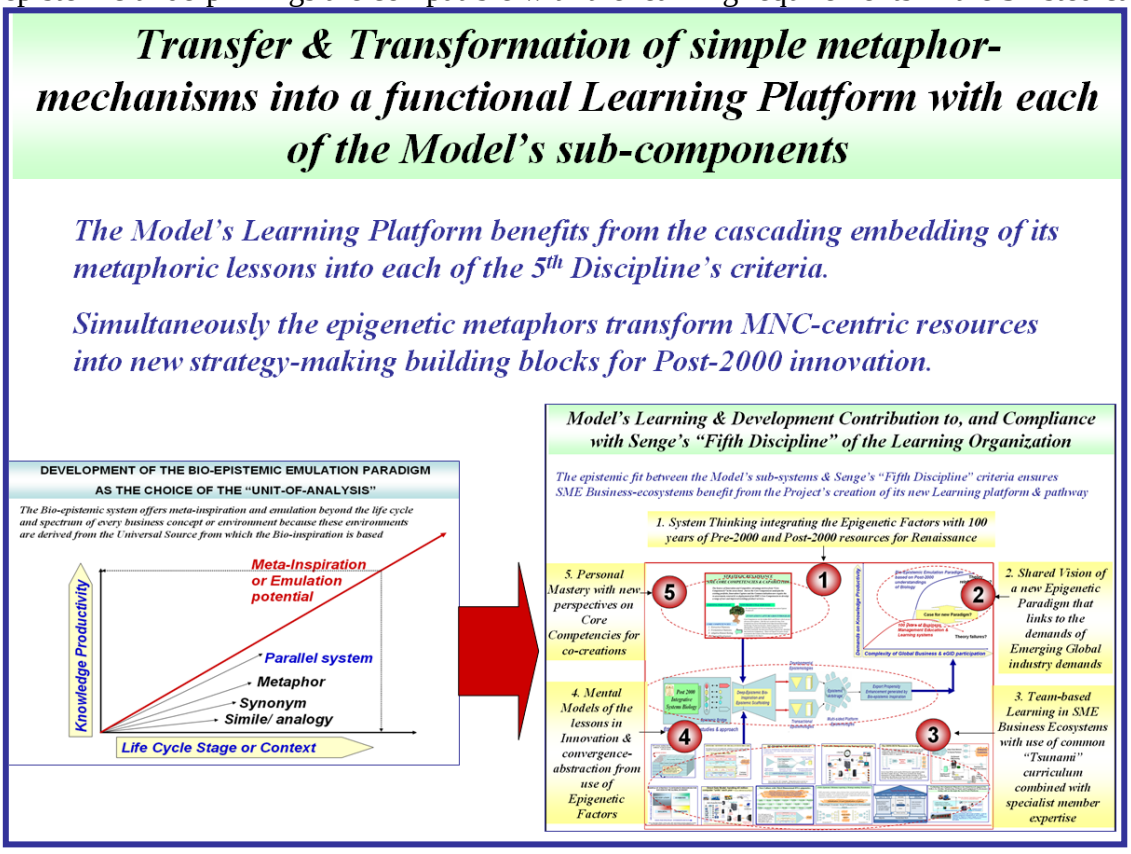


Figure 12.3 The Multi-functional Learning modalities actively embedded within the Bio-epistemic Model

In this context, the Research Question will address and determine the extent to which the Bio-epistemic Model and its ecosystems can leverage the benefits of the range of metaphors, parallel thinking, synonyms, and emulation and inspiration.

Figure 12.3 illustrates the expected conceptual arrangements for testing and extracting benefits from the range of metaphoric-learning elements. Further the portfolio of learning approaches can be used both individually and collectively – to create learning complexes and metao-level resources. The diagram illustrates the range of actors for potential combination, that makes for the learning-ecosystem, for almost every type of business–biological correlate.

12.4 "System Thinking" Learning with Convergence-abstraction generated Catalysis

These conceptual combinations need to be tested against Senge's –5th Discipline of Organisational Learning which are grounded on the extensive research work of Senge (1990, 1994, 1999 and 2000) and Smith (2000).

The context of the test, ie.to determine if SME-eGI learning outcomes can be achieved with the Model's capacity for "System Thinking".

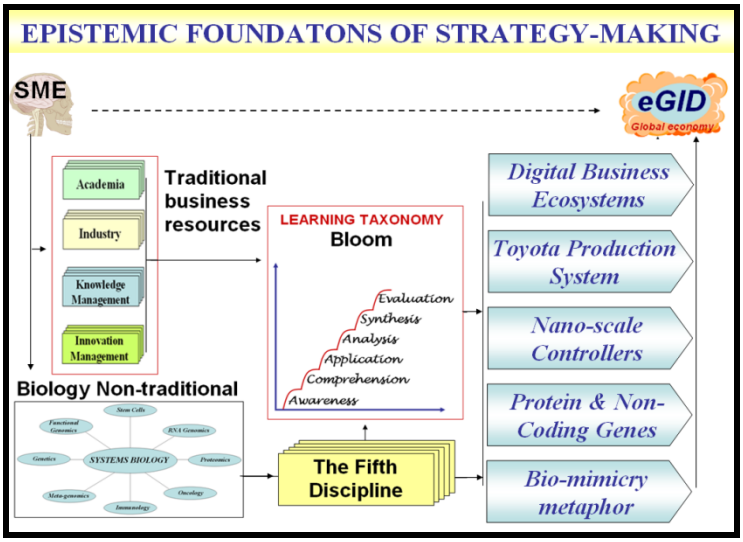
The defining value in adopting the "Systems Thinking" criteria in Senge's Learning Criteria is its capacity to test the Model's potential to use System Thinking for the required transformation of MNC-centric resources into "learnable" SME-eGI equivalents. The Model's "Systems Thinking" Learning functionality is critical because it needs to support the key tenant on the interconnection between the disciplines of Biology and Business.

Inputs from the Model's Bio-epistemic exemplars and epistemic catalysts need to both generate "Systems Thinking" for renaissance-quality content generation and process management in the dynamic settings and contexts of SME-facilitated business ecosystems.

In Table 12.1, sub-sets the Senge Fifth Discipline "Systems Thinking" criteria are presented in the left column and the degree to which they are satisfied by the Model are explained in the right column.

Table 12.1 Model's compliance with System Thinking for the Fifth Discipline Learning

System Thinking Criteria	Fulfilment by Model's In-built Learning Engine
(i) The Learning System proposed must focus on the whole of life cycle, not just snapshots of specific time-sensitive or phase-limited learning delivery	The Bio-inspired Model presents a whole of life-cycle that has relevance for learning and application. The Model requires that its epistemic exemplars and its Epistemic Catalytic lessons be actively and intensively harvested at all stages of development of the

	business ecosystem, beyond transactional lessons.
(ii) The Model's concept needs to present to framework for pattern identification, barrier resolution and visions of future focus  Figure 12.4 – The dynamic factors and entities that make the strategy-making landscape for SME-eGI learning The diagram illustrates the central role of the Bloom Taxonomy in mediating total system-like learning needs with (i) the 4 sources of traditional and MNC-centric knowledge (ii) the 8 bio-epistemic repositories of knowledge within the human-person (iii) the 5 progressive stages for learning from the nano-and micro-level through to multi-national and global organizational entities	Figure 12.4 illustrates how the Model's Learning System utilizes content and applies catalytic approaches to achieve pattern identification within the entire continuum. Figure 12.4 summarizes the result of the problem analysis conducted on the capacity of SMEs to develop strategies for participating in the global economy. The two available sources of knowledge available for strategy-making are shown in the left of the diagram. SMEs need to utilize the traditional-source lessons from Academia, Industry, Knowledge Management and Innovation Management. Systems Biology provides a parallel stream of potential lessons, which need to be transformed for functioning in the SME context through the learning methodologies (illustrated in the centre of the diagram). Five key epistemic "foundations" for strategy-making are shown in the right of the diagram as the final epistemic position from the problem analysis exercise.
(iii)The Learning potential of any Model must be the cornerstone of the multiple worlds in which it seeks to manage for "whole of life", not just "end-of-life" determinations. This testing requires the creation of a Mapping-type relationship for test validation	The Bio-inspired Model provides "meta-level" oversight and supervisory management and the lessons and the required learning of the Model's illustrated in Figure 12.5. The Model offers an in-built Learning Management system for the 2 parallel worlds of Biology and Business. The Figure attempts to map the relationships between their biology-business correlates and the transfer of lessons and catalytic transformation of Pre-

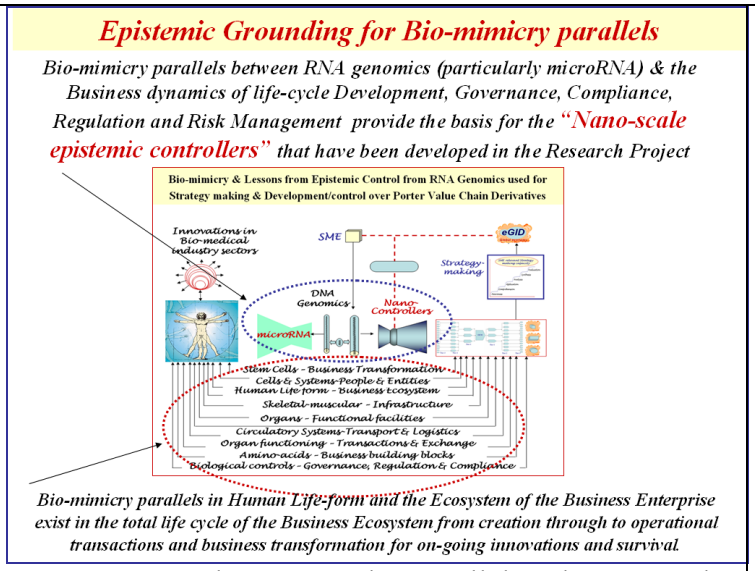


Figure 12.5 The Mapped "parallels" between the correlates of the Biological systems and the Organizational entities

2000 building blocks for Post-2000 relevance.

(iv) Any framework under Learning criteria review must offer long-term perspectives beyond short-term problem resolution.

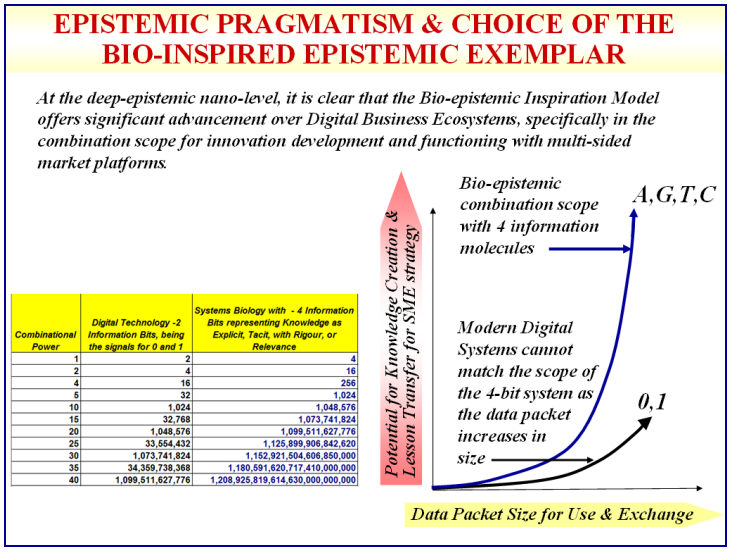


Figure 12.6 The Total System potential of the Bio-epistemic Exemplar mapped against the Binary digital system

Figure 12.6 confirm the long term nature of the Model's Learning System based on its grounding in Systems Biology.

Just as the world of IT system has proliferated from greater "packets" or units of digital exchange (from sequences of the 2 bits – 0 and 1). So will the Bio-epistemic system grow with our capacity to learn to utilize larger packets of bio-epistemic catalytic lessons.

(v) Candidate Models need to be assessed on their capacity to interpret and integrate variables, codification regimes with mobilizing potential and snow-balling addictiveness

The Bio-inspired Model has a specific in-built sub-system that is designed to provide:

(a) Interpretation of Post-2000 signal

(b) Integration of the Pre-2000

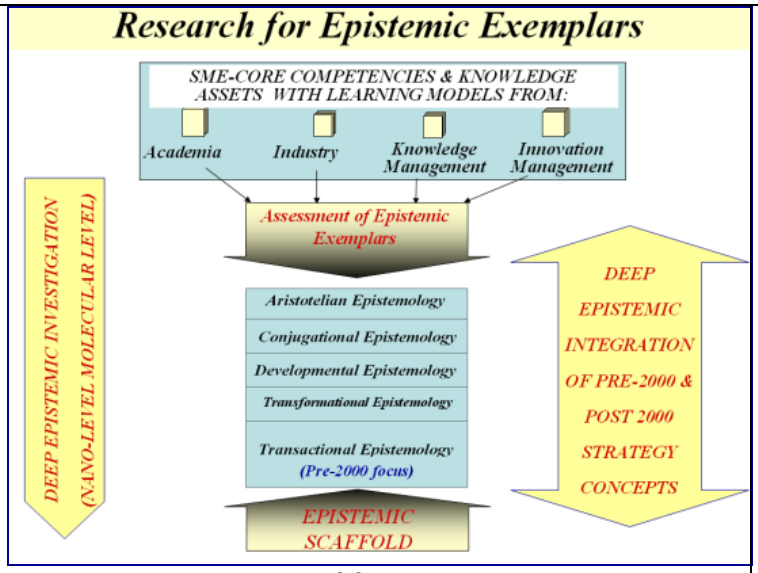


Figure 12.7 – The range of functional epistemologies that facilitate System Thinking enabled learning

building blocks that have been deconstructed and adapted by epistemic admixing with the defining catalysts

(c) Thematic codification for mobilizing the experiences and competencies of the ecosystem's membership.

The unbounded and relatively unlamented feedstock for the functioning of the Learning Engine is illustrated in Figure 12.7

12.5 Personal Mastery for Convergence Catalysis

Senge's Fifth Discipline "Personal Mastery" Learning Criteria is set in the context of learners or implementers of strategy possessing the competencies and capacities to "meta-manage" the challenges presented to them. In this context, the Personal Mastery of issues needs to be applied to the Bio-inspired Model in the context of being able to meta-manage the business ecosystem's functioning – both at the developmental phase and in the normal transactional modes. Further each contributing member needs to extend their "Personal Mastery" by being able to integrate their specific individual competencies within the ecosystem "whole".

In colloquial terms, the team of SME champions need to be morphed into a championship SME team. Again the Learning System of the Bio-Model is tested against 5 sub-criteria of Personal Mastery, per Table 12.2.

Table 12.2 Model's compliance with Personal Mastery for the Fifth Discipline Learning

Personal Mastery Criteria	**Fulfiliment by Model's Learning Engine**
(i) Models under test must deliver lessons for discipline crossing to engage multiple ecologies and multiple disciplines.	The Bio-inspired Model's Epistemic Engine is specifically designed to cross disciplinary boundaries and establish common units of exchange

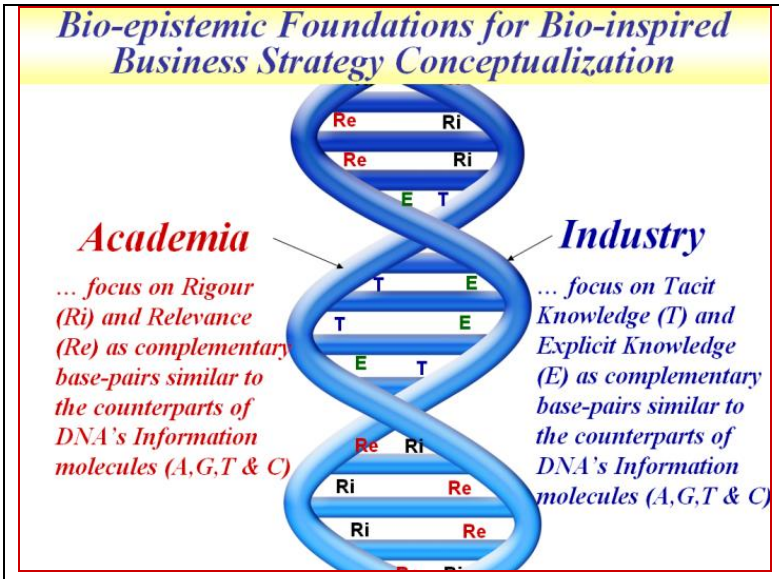


Figure 12.8 – How the 98% Epigenetic DNA segment generates lessons in Personal Mastery

The lessons in using the DNA-metaphor rsoundingly cover the Personal Mastery criteria by the manner in which lessons in total control are available for analysis and mimicry.

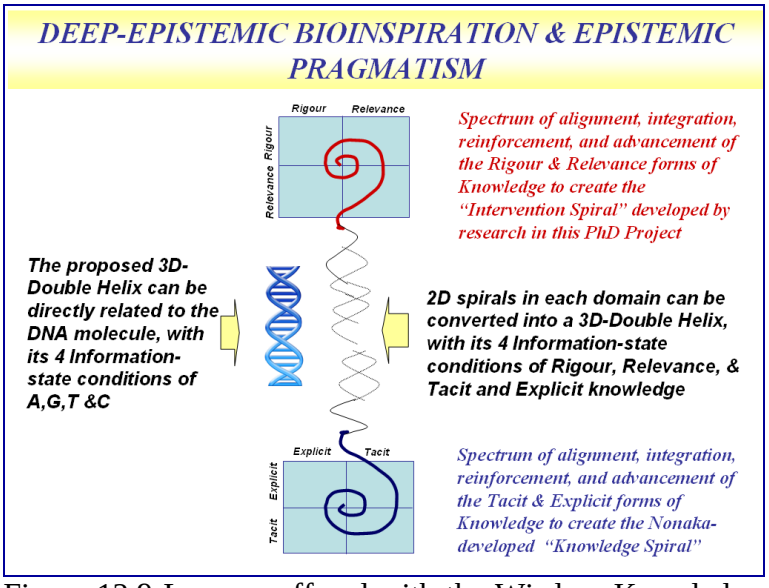
The 98% epigenetic DNA segment not only controls the entire gene pool over the entire life-cycle of the human life-form, but it is also responsible for the innovation-rich differences within the multiple protein representations that all derive from the same "gene pool".

Lessons in Personal Mastery derive from the manner in which the epistemic convergence-abstraction exemplars can similarly dominate and transform the MNC-centric resources.

across ecologies and ecosystem membership. Figure 12.8 illustrates the common legacy of all knowledge and basis for the epistemic metaphor for multiple discipline cross over.

Figure 12.8 illustrates the deep epistemic parallels that can be considered between biology and business in the context of the DNA information management system used by Nature in its management of knowledge. Deoxyribo Nucleic Acid (DNA) is the master-file system that resides in every human cell and provides the information for the transformation of the cell to function in the different cells, tissues, organs and systems of the human body. The DNA molecule itself requires the two helical strands (that make up the double helix) which in turn provide the back-bone or scaffold to hold-up and contain the 4 information carrying nucleotides of Adenine, Guanine, Thymine, and Cytosine (commonly represented by the letters A,G.T and C). The Biology-business epistemic parallel exists in the context that business relies also on the information backbone of knowledge from Academia and Industry. The four

	types of information molecules A,G,T,C also have parallels in the categorization of knowledge that needs to be Relevant, Rigorous and in the form of Tacit knowledge or Explicit in nature. Users of the Model can with the above metaphoric catalyst bridge all disciplines and link them with the thematic categorisation for functional innovation. The selection of Human Systems Biology as the subject for the required epistemic Components: (i) Academia and Industry – the 2 strands of the DNA that hold up the 4 nucleotides of AGTC (ii) The 4 Nucleotides – of Rigour and Relevance (insisted upon by Academia) and Tacit and Explicit Knowledge (the quest of Industry) bear direct relationship to the 4 nucleotides of DNA (AGTC) (iii) Academic Intervention and its focus on transactions: messengerRNA (iv) Protein production – the interactions necessary fo the Porter Value Chain

	activities (v) Developmental systems and Stem Cells conversion to Mature single functional cells (vi) Ecosystem development and Cell niches, tissues and systems building into the total ecosystem (vii) Nano-epistemic controllers in microRNA (viii) Proteomics – Cycles, chains, platforms, modules, controls, governance, regulation.
(ii) Users of the Model under review must be able to learn to capture new insights by combination of knowledge from multiple disciplines  Figure 12.9 Lessons offered with the Wisdom Knowledge-spiral for Personal Mastery-facilitated learning The potential of the Bio-epistemic Exemplar is boosted when the combination of Tacit Knowledge, Explicit Knowledge are combined with the learning characteristics of Rigour and Relevance.	Figure 12.9 illustrates how the epistemic parallels that exist between biology and business may be grounded in deeper epistemic relationships. At the base of the diagram for example is Nonaka's acclaimed "Knowledge Spiral" which results from the interactive admixing of Tacit and Explicit knowledge in industry settings. Nonaka has suggested that innovations can be developed by the management of this iterative process. For industry advancement, the continued interaction and mutual reinforcement of tacit and explicit knowledge is an essential requirement for the further knowledge growth that takes place in the form of a reinforcing spiral. A

2Dimensional Knowledge spirals merge into 3 Dimensional knowledge-wisdom entities, with a direct parallel to the Double Helix of the DNA molecule	similar 2 dimensional industry knowledge spiral can be created for the integration of Academic contributions made available to business knowledge. In this grid, academic knowledge is subjected to the twin reinforcing criteria of Rigor and Relevance. The Academic equivalent of the industry knowledge spiral is shown in the upper section of the diagram. Finally, the diagram also indicates the scope for the two 2-dimensional spirals to be combined into a single 3-Dimensional helix. The two strands can be envisaged as the twin spirals or the skeleton of the DNA molecule. Essential the Model's Learning Engine will deliver one of knowledge management key ..... – the learning capacity to combine tacit knowledge and explicit knowledge as illustrated in the dynamics of Figure 12.9
(iii)Any candidate Model must include learning provision to benefit from personal experiences and observations. Personal experiences are the epistemic glue and the motivation for learning	Personal experiences engender credibility of message. Receivers of the Model's lessons can directly relate to the source of the information and the human biology. Figure 12.10 illustrates a further example of the bio-epistemic parallels between human biology

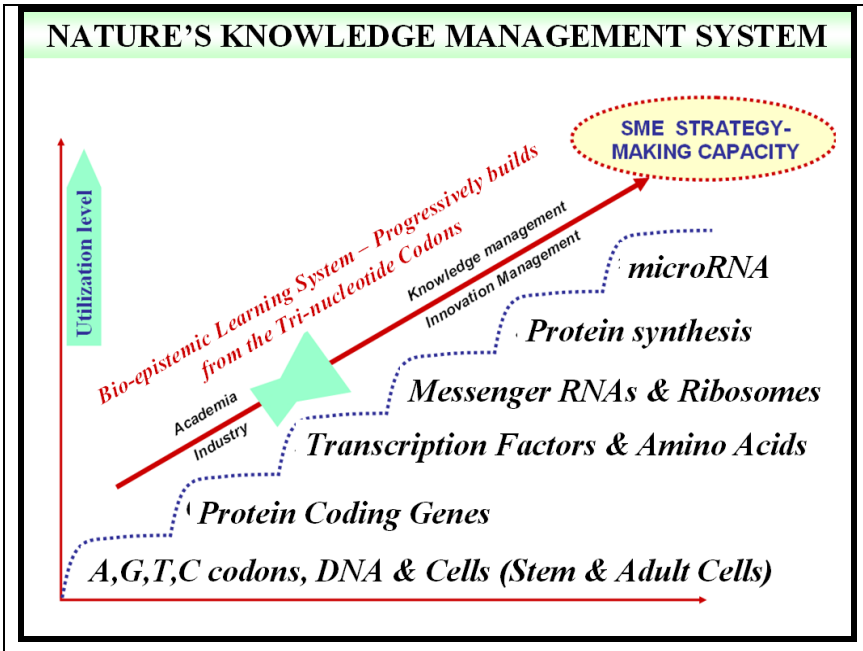


Figure 12.10 Lessons offered with epigenetic mediated Ascent Routines to transform BME learning and development

and business strategy-making. The diagram illustrates the stages through which Nature manages its knowledge portfolio of epistemic building blocks before the production of its proteins. Nature starts with the combinations of 3 information states (within the nucleotides) to progressively build the protein under the action of the protein coding genes, transcription factors, and messenger RNAs. The final protein complex is delivered under the control of the microRNA information elements.

(iv) To capture Learning potential from Personal Mastery, candidate Models before adoption need evidence-based concepts that can be learned by other ecosystem members

The Bio-inspired Model and its Epistemic Catalysts and the Epistemic Engine are all based on hard scientifically proven research.

The Learning Ascent Routine illustrated in Figure 12.10 for example are entirely based on systems Biology and ongoing findings from research with the 98% DNA segment involving RNA genes.

(v) To capture the learning potential from the Personal Mastery Criteria, candidate Models under review need to leverage knowledge between the past and current, with a capacity to reframe, adapt and unify the "mix and match" aggregates of relevant knowledge

The Model's Epistemic Engine is specifically designed to blend and re-present Pre-2000 knowledge by admixing and embedding their building blocks.

The epistemic catalysts of identity, integrity, agility,

	visibility, variability, etc are designed to assist learning and innovation capture with Post-2000 relevance.

12.6 Mental Models for Convergence Catalysis

Senge's Learning Criteria has received acclaim for its capacity to identify and mobilize the resources of the Mind and the Brain for learning. The mentalizing capacity is also mandatory for acclerated learning. In Table 12.3 representative elements that make up the Mental Model criteria are compared with the Model's Capacity to deliver the required learning outcomes.

Table 12.3 Model's compliance with Mental Models for the Fifth Discipline Learning

Mental Model's Criteria	Fulfilment by Model's Learning Engine
(i) Senge's Mental Model Criteria requires that candidate systems presented for assessment must generate coherence of thought with ingrained pictures and images for new learning	The creation of Mental Models is the primary function and mechanism that characterizes the Bio-inspired Model. With the benefit or epistemic feedstock of the Epistemic Catalysts, the Model's epsitemic engine seeks to advance learning to the state of generating behaviour that enhances SME effectiveness.
(ii) Senge's Mental Model Learning Criteria requires linkage to behaviour	The Bio-inspired Model and its Engine are focused and primed to deliver thematic behaviour – at the development stage and in transactions. Chains, cycles, platforms, bridges, and transitions – are all dynamic facilitators of behaviour that is enhanced with the thematics of integrity, identity, agility, mobility, and velocity, etc.
(iii) Candidate Learning Systems need the Mental Model criteria to prevent going down blind alleys. They also need to provide a reflective framework for ongoing	The Bio-inspired's Model offers an inherent learning mechanism to ensure that all behaviours are well targeted to deliver thematic

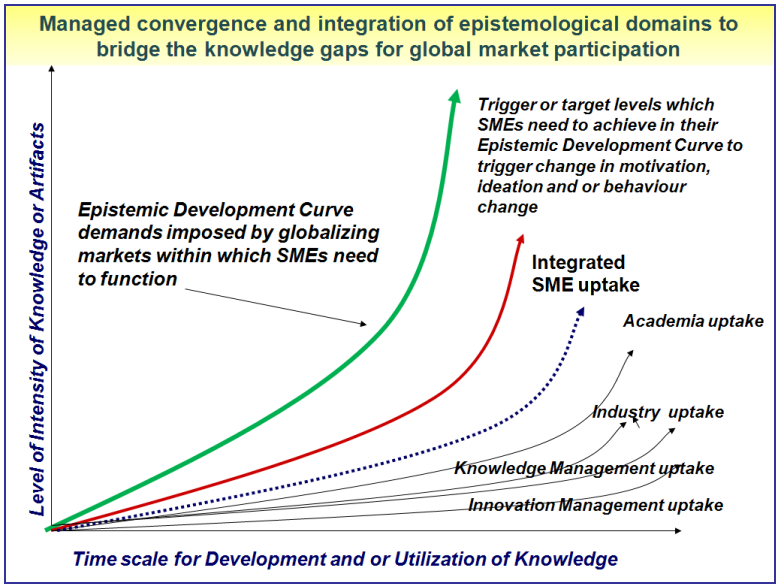
assessment	outcomes that directly relate to desured customer value prepositions. The embedding and enhancing of Pre-2000 building blocks with epistemic catalysts and themes that focus on customer valued outcomes provide the highest levels of effective reflection for value relevant strategy-making.
(iv) According to the role of Mental Model based learning is directly related to the need to recoginizing and leveraging the interdepencies that exist among ecosystem-based resources	The Bio-inspired Model is specifically designed to generate new thinkin and innovative constructs by leveraging interdepencies. The Management of Convergence is the mechanism to harvest value from interdepency relationships, common resources bases, and mutual advantage from integration
(v) Senge's requirements from Mental Model-based learning are to achieve better understandings of abstract constructs	The Bio-inspired Model's Epistemic Catalysts are the direct manifestation of epistemic abstractions – that are required for embedding and resulting enhancement of Pre-2000 Building Blocks. In a vital step, the Epistemic engine also brings to life the Abstraction concepts and links them to Customer Value Propositions for new Post-2000 strategy-making.

12.7 Shared Visions for Convergence Catalysis

In Senge's Learning System requirements all entities within an ecosystem need to collaborate if they are to maximize their individual and group outcomes. The resources and learning facilities required for the achievement of shared – vision – generated Learning are presented in Table 12.4 against the facilities and dynamic capabilities of the Bio-inspired Model.

Table 12.4 Model's compliance with Shared Vision for the Fifth Discipline Learning

Shared Vision Criteria	Fulfilment by Model's Learning Engine
(i) Senge's Learning Criteria requires a capacity to recognise the diversities within ecosystems so that they	The Epistemic Catalysts of the Bio-inspired Model are

	can jointly share mental models for collaborative behaviours	directly turned into delivering and generating shared vision for the SME organised business ecosystems. Further the Model categorises the epistemic exemplars with 1:1 relationship in the business-biology correlates.
(ii)	Senge's Learning Criteria requires definitive mobilizing, galvanizing and behaviours focused aggregation of shared resources	The thematic Epistemic Catalysts are uniquely positioned to generate and deliver learning outcomes from joint and collaborative action. Common units of exchange and common points of reference fully satisfy the shared vision deployment.
(iii)	Senge's shared vision-based Learning Criteria requires a capacity to be generative and transformative in order to leverage the interdependencies that are identified among ecosystem landscape and domains  Figure 12.11 Parallel learning and uptake of metaphor lessons to match global demand for knowledge	The Bio-inspired Model has been specifically created for exactly this learning function – using the in-built vision sharing common platform. Figure 12.11 for example outlines the domains and the epistemic landscape of Post-2000 business. The Model's Epistemic Engine and the Catalysts are designed to facilitate the integration of the different knowledge sources though a unification platform.
(iv)	Senge's Learning Criteria shared vision requires assessed systems to manage intra-inter-and extra-system interdependencies, with clarity and insights on	The Bio-inspired Model specifically satisfies this criteria with the embedding

their future	of epistemic themes of identity, rehabilitee, integrity, etc that once embedded within notionally disparate systems then brings into focus the benefits of thematic management of interdependencies. The clarity of purpose established by the thematic clusters provides insights into knowledge gaps requiring additional but marginal scale learning.
(v) Senge's shared vision connected Learning Criteria requires evaluated systems to leverage personal connectivity in simultaneous fashion with collaborative delivery of equitable and non-partisan outcomes	The Bio-inspired exemplar is the human life form and its health and pathology. The personal lessons for learning are directly applicable to the entire ecosystem membership. The visualization of unbroken chains, cycles, or fulfilment trajectories that are required in human health are the best learning exemplars.

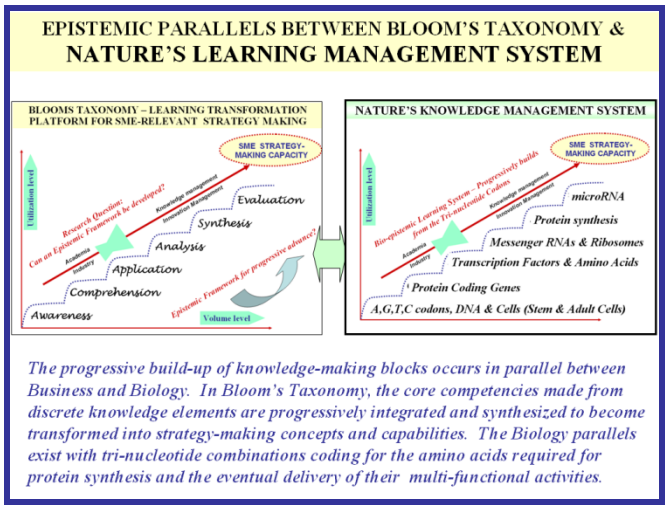
12.8 Team Learning for Convergence Catalysis

Senge's research has confirmed the need for leveraging the power of knowledge aggregation from all sources within an ecosystem, so that the Learning outcomes extend beyond the lowest common denominator equivalent.

With Post-2000 strategy-making the unit of Analysis and the unit of operation is the combined business ecosystem. Group/ Team – involved learning is mandatory because in the Post-2000 business landscape, it is ecosystems which competes with other ecosystem. Individual MNC or SME-connected competition in stand-alone mode are irrelevant to global business.

The Model's management of Epistemic Connectivity is the dogma of faith for Post-2000 strategy-making. It is in this context that Table 12.5 evaluates the Model's compliance with the group learning criteria.

Table 12.5 Model's compliance with Team-based Learning for the Fifth Discipline Learning

(i) Senge's Group Learning Criteria requires epistemic constructs under evaluation to: (a) Facilitate shared dialog (b) Create a fusion of ideas, and (c) Generate common interpretation of challenge.  Figure 12.12 Team-based Learning to achieve the Ascent Routines with epigenetic catalyzers`	Figure 12.12 illustrates the business and the biology parallels with the use of epistemic building blocks in both cases with their respective ecosystem. On the left of the diagram is the classical Bloom's Taxonomy of Learning which is ecosystem required for the creation and development of ecosystem relevant learning for business strategy-making. SME learning is required for SMEs to learn to utilize the $1 Trillion-100 year accumulated knowledge-base. On-demand and permanent behaviour in strategy-making can only be achieved through such learning. Direct learning from Nature's Knowledge management system (shown on the right) ensures the continued build up and transformation of the epistemic knowledge base contained in the 3.1 billion cod of the DNA molecule. Through continuous Group/Team "Awareness and Comprehension" the information elements in the DNA molecule commence their genetic-epistemic progression through the expression of the protein coding genes. Messenger RNA information molecules are used to select the amino acids specified in the information code of the tri-nucleotide codons. The dominant lessons from the epistemic parallels are that the overriding control exercised by the epistemic correlates of the 98% DNA such as the microRNA molecule. In the final "Evaluating stage" of the Bloom's Taxonomy parallel, the dynamics of the microRNA can decide if the protein synthesis finally takes place or not. The business parallel of strategy-fulfilment therefore obtains lessons knowledge fusion and common interpretation of

	challenges.

12.9 Conclusions

The Bio-inspired Model has been created with specific segments that deliver and perform the transformed strategy-making capacities for SMEs within business ecosystems. In the process-layout order of the Model, bio-inspired epistemic Catalysts are derived from Post-2000 system Biology. These involve recognition of the transformative, generative and adaptive role of emergent conditions of state such as integrity, agility, usability, etc.

The catalysts then serve as the feedstock for the Model's Epistemic Engine. Here the embedding of the catalysts with Pre-2000 and Post-2000 constructs and building blocks take place. The Epistemic Engine provides additional functions beyond knowledge aggregation and strategy-making transformation. In this Chapter, the power and capacity of the Epistemic Engine has been presented in the context of the Project's second Research Question on its Learning potential.

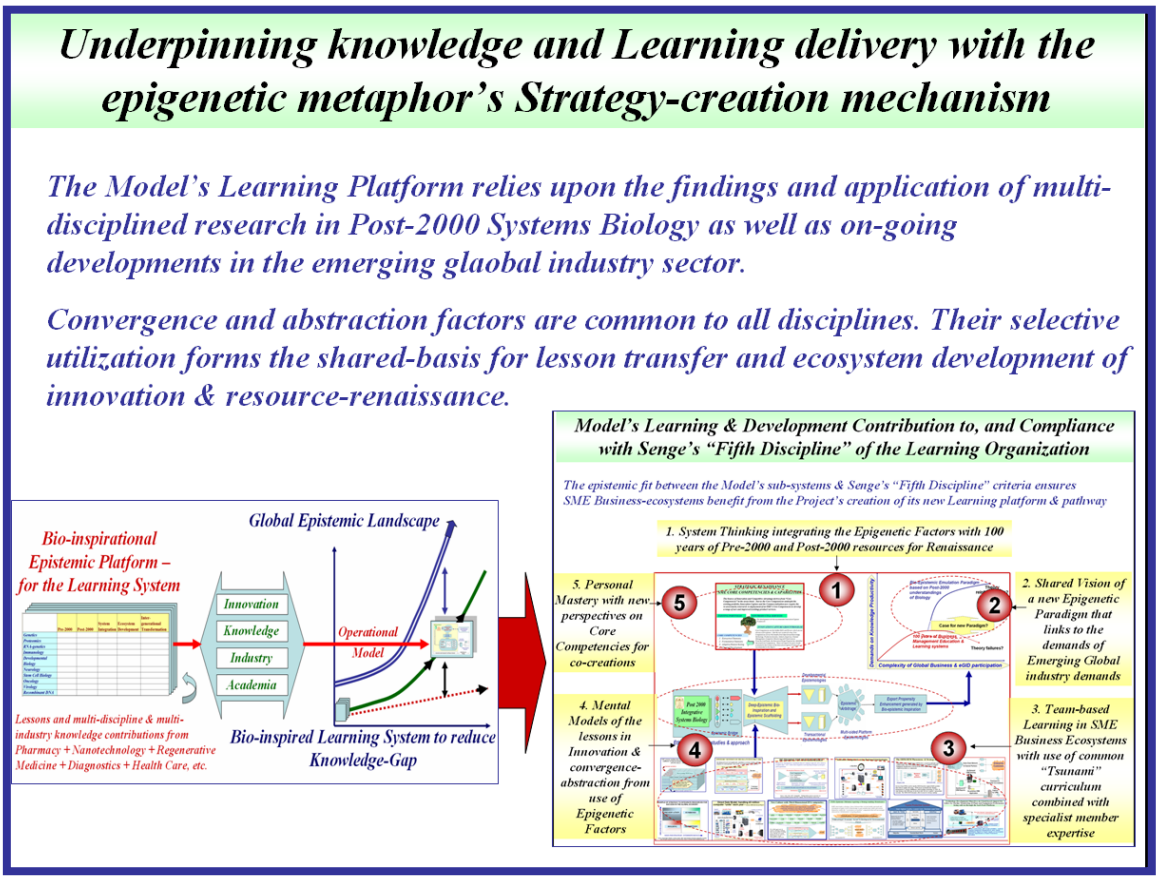


Figure 12.13 Using Convergence-abstraction exemplars from multiple sources for Learning and Model implementation

Figure 12.13 illustrates how the Engine's Learning framwork is capable of accepting epistemic feedstock from multiple sources (lower left of Figure 12.13). By deploying the Learning

potential and lessons from its catalysts, the aggregated knowledge can contribute to dynamic knowledge gap management (illustrated on the centre of the diagram). The net result is that the Model is capable of satisfying the Research Question. Its learning and implementation potential can also reposition the SME-ecosystem to take advantage of the innovation launching-pad on the Boisot I-space (per illustration of Figure 12.14).

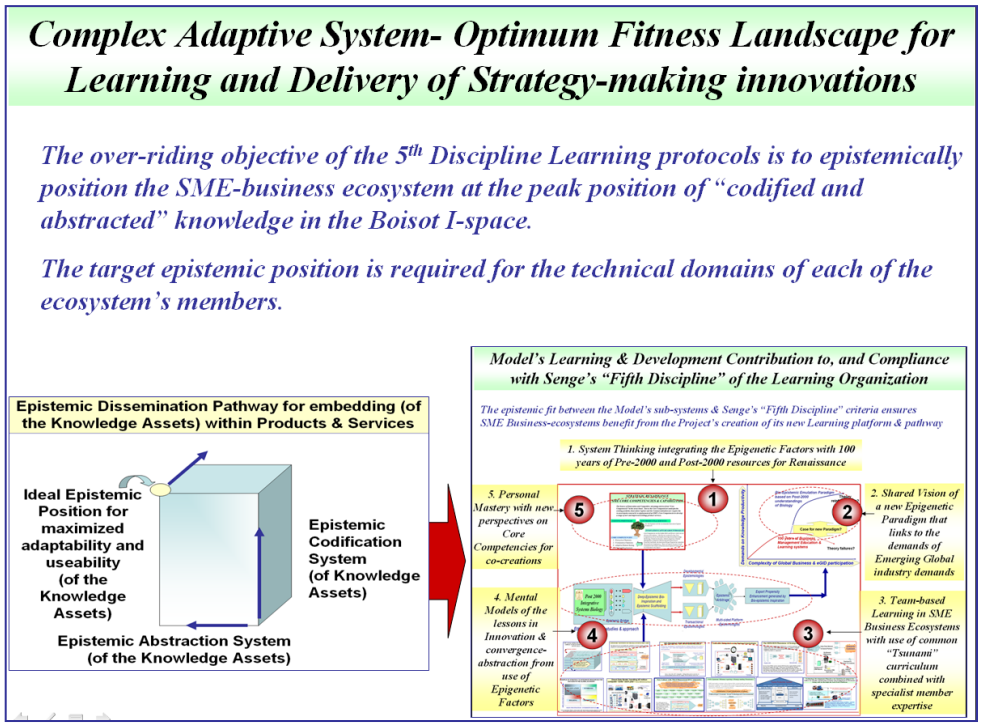


Figure 12.14 Using the Boisot Fitness Landscape

In conclusion it can be argued that the Model has satisfied the second of the 5 testing regimes through which the underpinning epistemologies have been subjected.

12.10 Chapter Summary

This Chapter has focused on Learning and the scope for the Bio-inspired Model to be able to directly assist in the delivery of learning protocols that would deliver a pathway to SME-eGI strategy-making success while dismantling barriers associated with the use of MNC-centric resources. Specifically the Chapter has also addressed the first 3 of the Project's Research Questions with unambiguous determinations that the Model's Epistemic Engine can deliver with multi-functional capacity to (i) make sense of the epistemic barriers, (ii) develop a Learning Management approach, and (iii) justify the epistemic basis of the Model created.

The Chapter has confirmed the Model's status on the basis of its compliance with and support to Professor Senge's "5th Discipline of Organizational Learning". The Model's portfolio of Convergence-abstraction cognitions has been proven capable to not only deliver new SME-relevant Post-2000 strategies but simultaneously offer its implementers a learning platform with good prospected for further enhancement and success in perpetuity.

From this position we advance into Chapter 13 where the Model will be subject to the first of 3 further testing regimes. Essentially we are now proceeding with the testing regimes to determine the potential for the Model's continuum and capacity to harvest and implement high order thinking and cognition for:

(i) Framing new thinking for SME created innovation in the Post-2000 era (Research Question 1 – Chapter 11)

(ii) Learning resources for knowledge gap control (Research Question 2 – Chapter 12)

(iii) Scientific grounding of conceptual foundations of the Model and its initial dependence on the epigenetic exemplars applied to the domain of Proteomics (part of Research Question 4 – Chapter 13)

(iv) Perception testing of the Model's capacity to cover the typical scale and scope of the wide-ranging issues within emerging global markets (part of Research Question 4 – Chapter 14), and

(v) Practical testing directly applicabale to local Australian SMEs, in their hypothetical use of the Model (part of Research Question 4 – Chapter 15)

In Chapter 13 we seek to explain how a specific group of proteins, the neurotransmitters create, adapt, utilize, and deliver the "Macro-convergence-abstraction" interventions for observable human behavior, including SME business strategy-making.

CHAPTER 13 THE NEUROBIOLOGICAL BASIS FOR BIO-INSPIRATION MODEL

13.0 Introduction

This Chapter focuses on the scientific explanations that underpin the "neuro-preconditioning and neuro-interventions" of the Model's convergence-abstraction mechanisms. The Chapter demonstrates that neurobiological impacts of the epigenetic factors and their correlates within the Mind-Brain. By focusing the attention on the neuro-transmitters or Brain proteins, we seek to explain how the transference can elevate the Proteomics-based epistemic exemplar (or metaphor) to the status of a direct "Causal mechanism",

The Chapter makes the case that interventions of the epigenetic factors in the brain's anatomy are directly the cause of, and are responsible for all human behavior. This specifically includes the processing of all strategy-making building blocks, other strategy-making inputs, hiher order thinking, and downstream cognitive behavior.

Neuro-science-based explanations are offered by global scientific research (like Functional MRI studies and Brain scans) that justify the neuro-protein basis of the Model, Sceintific research findings in genetics and medical research confirm the role of the epigenetic factors (outined in Chapters 10-12) as the Original Driving Mechanisms (epigenetic ODMs) for the adaption, transformation and generation of strategies relevant for SME succes with new industry opportunities and innovation-creation in emerging markets.

Prior to the stage of Concept Testing our Project has focused its efforts on utilizing the bio-epistemic parallels between the units of knowledge in business strategy-making and in biology based protein-making (ie. the science of Proteomics). We argued that both biology and business strategy-making shared methodologies in the use of epistemic building blocks that enabled lessons from biology to be transferred to business strategy-making. The concept of bio-mimicry for business strategy making was developed on the basis of the strength of the bio-epistemic parallels that were identified in Chapters 4 - 9. The Operational Model developed in Chapter 10 integrated the bio-epistemic lessons and embedded their nano-scale controller and Epistemic Engine and catalyzers into the transactional, developmental and ecosystem-centric considerations for strategy-making. This formed the basis for the Bio-mimicry Model which is now being subjected to the final three stages of validation – ie. the Concept Test on the Operational Model.

In this section we present the argument that the bio-mimicry can be justified beyond the"proteomics" basis of epistemic parallels for Bio-mimiced SME strategy-making. Using the research findings of the world's foremost thinkers and researchers in neurobiology and applied psychology, we explain that the bio-mimicry model is in effect grounded in the neurobiology of cognition and behavior. The transference bridge from metaphors of proteomics to cognitive neurobiology is the special group of proteins called neurotransmitters. The follow both the protein-epigenetic as well as the high-rfer brain functions of cognition, memory, learning and execution.

In Figure 13.1 therefore we illustrate the Neurobiological basis for the Model's Concept validation by subjecting the Model's Inputs, Processes and Outputs to a range of scientifically grounded constructs on the lessons from Brain proteins (the neuronal portfolio of epigenetic factors that operate the neuronal circuits that generate behaviour). We argue that they confirm the Model's validity to develop the required strategy-making capacity which overcomes the dissonance and epistemic positioning between SMEs, MNC and the eGID landscape.

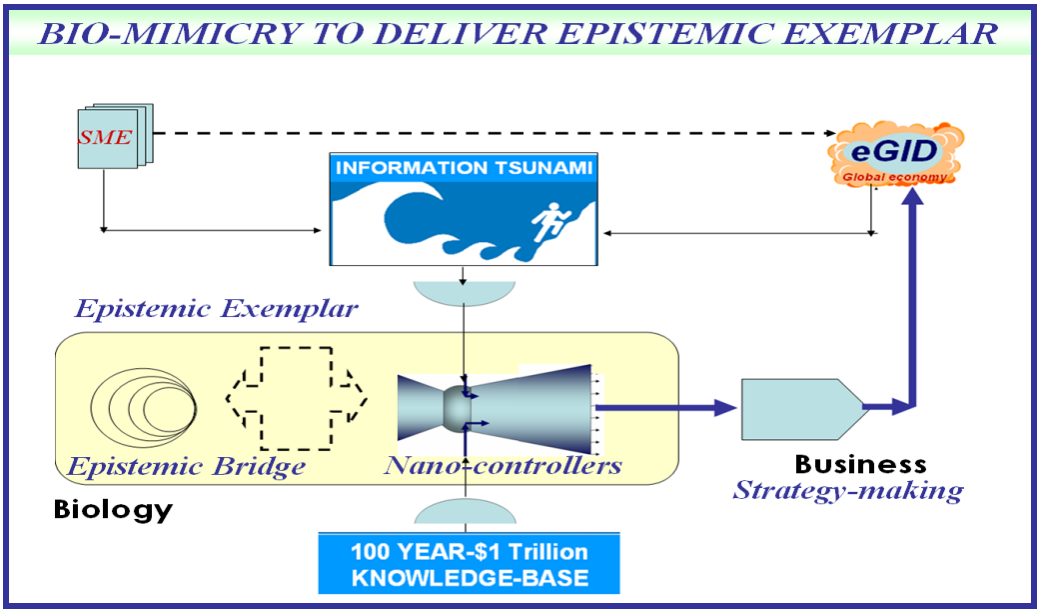


Figure 13.1 Advancing from Bio-mimicry to the Neurobiology Paradigm

13.1 Definition of terms

Brain Atlas is defined as the mapping of regions of the brain that is associated with dedicated functions and specific behavioral activities that are mediated by macro-scale Convergence-abstraction mechanisms

Macro-scale Convergence-abstraction mechanisms are defined as the epigenetic and genetic exercising of, and the interventions imposed by the DNA molecules on high order thinking

Synapses and Dendrites are defined as the extensions of individual brain cells that are responsible for the collection of signals embedded within the neuroproteins that exchanged between the neuron cells in close synaptic-cleft proximity

Brain proteins are defined as the group of proteins that are responsible for the initiation, adaptations and execution of the Brain-Mind-Behavior chain by virtue of their functioning within the neuron cessls of the human life-form

Mind-Brain phenomena is defined is the separation of the brain's over-riding control (Mind) which is different from the neuro-anatomical functioning of the neuronal cells (the Brain(

Neurons are defined as cells that are utilized by the Central Nervous System and the Peripheral Nervous System

Neuronal Circuits are defined as the groups of neurons that when activated in a region in the barin's anatomy are responsible for brain functional activities specific to that group

Motor Neurons are defined as the groups of neuronal circuits that are responsible for managing andcontrolling human movement of limbs and other musceles

Neuro-transmitters are definced as the group of proeins that operate in the brain that med, initiate and terminate and control brain functions

Neurobiology is definced as the study of the development and the dynamcis of the neurons and the neuronal bio-ecosystems that manage human brain behavior

Neuro-preconditioning is defined as the Model's methodology whereby the convergence-abstraction attributes are

13.2 Neuro-strategy-making paradigm

In this section we present the case for moving the Research Question on the Model's validation from the context of general epistemic parallels (with its Bio-mimicry mechanisms) of general Proteomics to Neuro-transmitter type proteins and neurobiology. The dotted element in the centre-left of the Figure 13.1 represents this transference bridge. The neurobiology of cognition is both the new Unit of Anaysis as well as the mechanism that underpins the transfer to Bio-inspiration and Neuro-strategy-making paradigm.

13.2.1 Research Question response methodology

The multi-disciplined nature of the Project's research and this Chapter's transference from genereral proteomics to epigenetic-neuroboiologies, have required the adoption of an Engineering and Scientific method of testing of the Research Question-constructs with the 3 levels of testing:
(i) Conceptual level (Chapter 13): Subjecting the Model's neurobiology created ideas and new concepts to assessments and analysis for strategy-making and SME-relevant Post-2000 industries;
(ii) Perceptual level (Chapter 14): Subjecting the Model's new method and new approaches to the expected demands of the future era of the Post-2000 business landscape, as expounded by the predictions of futuristic thought-leaders; and
(iii) Practical level (Chapter 15): Carrying out testing and validation through Model experimentation with real world examples..

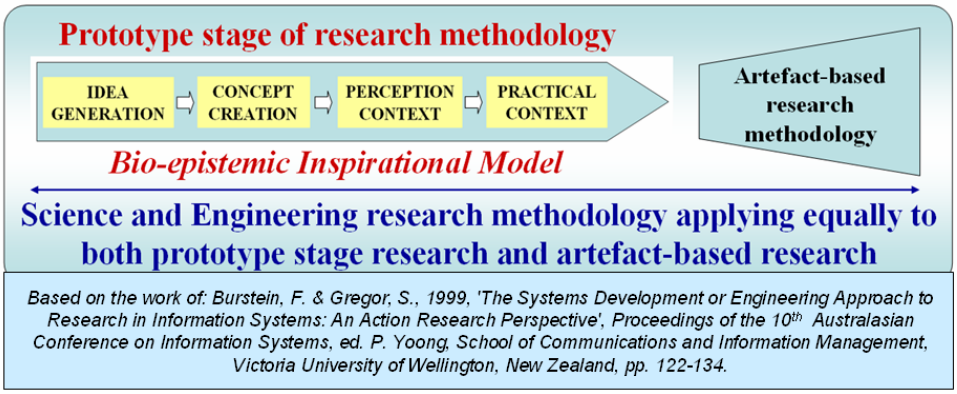


Figure 13.2 illustrates the proposed manner in which the Bio-mimicry based idea and its Operational Model is being tested for epistemic validity and use of the lessons available for strategy-making

The approach of Figure 13.2 has been adopted because the resources and reports being used to test the Model are drawn from science-based research. Their findings, conducted in the fields of molecular and cellular biology, neuro=psychology, medical imaging, and the study of pathologies such as oncolog, etc., are being used to support the application of the Model's epigenetic factors in higher order thinking.

13.2.2 Paradigm Shift transforming the "geenral proteomics" Bio-mimicry Model to Bio-inspiration (Neurobiology-expalined) Neuro-Strategy-making

Figure 13.3 illustrates the issues of the Model's capacity to introduce a paradigm shift in SME-strategy-making.

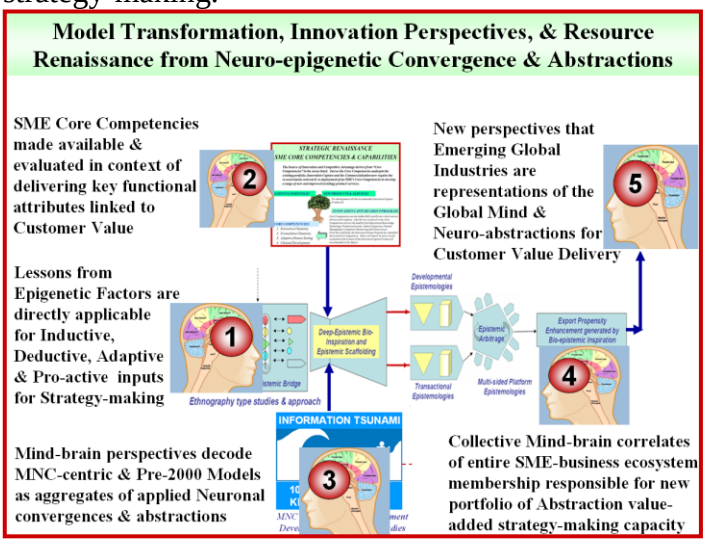


Figure 13.3 The neuro-psychological issues creating a new paradigm for SME strategy-making

The successful and scientifically based testing and justification from neuro-psychological factors affect every part of the Bio-mimicry based Operational Model. Thee influeances and interventions from neuro-epistemic catalysts affect every segment of the Bio-mimicry Model. Items 1 to 5 are further detailed in this Chapter. Each of their neuro-epigenetic catalysts provides further justification and elevation of the Model to the status of a full "Bio-inspirational"

Model or paradigm. The enhancement has been made possible by the combined effects of the Post-2000 understandings in Cognitive Psychology and Post-2000 Neurobiology, and the constructs of behavioral psychology. Together they confirm that all strategy-making must be considered in the context of applied neuronal interactivity. The final round of testing on the Research Question captures this Neurobiological resource-base as illustrated further.

13.3 The Convergence of Epistemologies

This section presents the need to converge the epistemologies of different factors and functions required for strategy-making. The convergence engine is the geometric connectivity that grows from the nano-scale spatio-temporal geometries of the DNA molecules genes and functional elements and advances into visible images of the dynamics of the brain's architecture and cognitive functioning.

13.3.1 The Neurobiology of Transformative strategy making

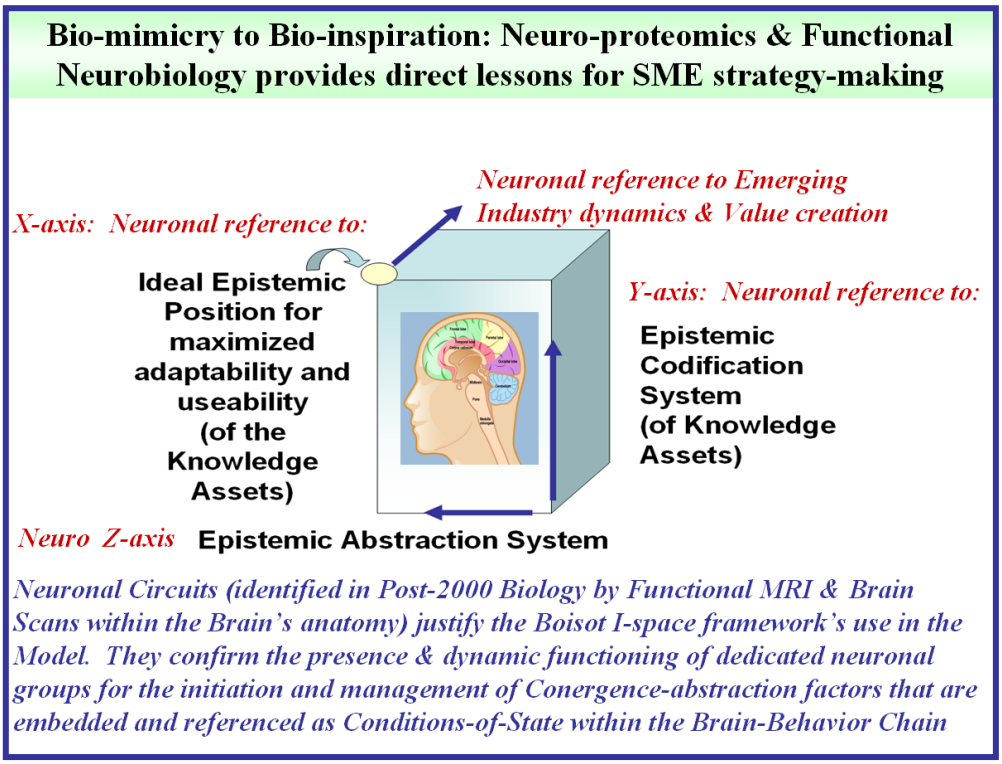


Figure 13.4 The transformative impacts of epigenetic catalsysts using the context of Post-2000 Neurobiology

The Boisot I-space illustration in Figure 13.4 presents the case for the conceptual test being performed in this Chapter. As a foundational input to the Vio-mimicry Model's development and functioning, the conceptual validation of the Boisot I-space in the context of Post-2000 Neurobilology is of strategic importance.

In this context, the Y-axis expands beyond its initial representation of the integration and variation of the generic strategy-making building blocks. Functional MRI studies and brain scans confirm that definitive and deterministic neuronal circuit-signatures exist for each of the knowledge elements within the X-asis portfolio of "Codified Knowledge", The new neuronal reference to the epigenetic catalysts offer potential to enhance the rate, scale and scope of innovation and global success by X-axis transforamtion. Much of the descriptions and resources that are published by industry and academia can now be more easily incorporated intothe I-space and the objectives of attaining the optimum "Fitness Landscape" target. Also the Y-axis represents the strategy-making building blocks, much of them from the Pre-2000 era of business studies can attain renaissance with rigour and relevance to emerging market needs.

Potential for major transformation and acceptance of the Boisot I-space applies tot heZ-axis, by moving away from relatively remote abstract thought to the visibility of its implementation within the Mind-brain's anatomy.

The Z-axis focusing on Abstractions or attributes of thinking or mentation has been the major challenge for strategists. The epigenetic portfolio of mental and epistemic conditions of state as the group of attributes can now be elevated in the minds of SME-ecosystem members to deliver the required "Value-creating Abstractions" for strategy– making.

The appeal of the Boisot I-space is grounded on reaching the peak (Y,Z) coordinates as the optimum launch-pad for innovation. In this context we overlay the findings of scientific research from molecular, cellular and genomic biology, and more specifically as it applied to the functioning of the Mind and the Brain.

The Neurobiological perspective of the Boisot I-space delivers:

(i) X-axis – represents the Neurobiology of the Brain's Architecture, with clusters and groups of neural circuits and synaptic connections. They are the neuronal reception centres, the intermediate stops, the transition points, and the transfer stations for neuronal message delivery in all human behavior

(ii) Y-axis – represents the Neurobiology of Brain Functions of Memory learning, emotion, cognition, somato-sensory and motor-coordination functions, etc

(iii) Z-axis – we argue should represents the Neurobiology of the Mind, with its attributes of mentation that can deliver functional abstraction. The Z-axis contains the attributes of the mental states of ability, andacity, agility, dexterity, ingenuity, identity, integrity, perspicacity, sagacity, and versatility, etc

13.3.2 The Neurobiology of the Mind

For the concept testing stage we argue that the Z-axis of Abstraction represents the Mind, the actions of the 98% DNA molecule. We further argue that an ontological structure exists with these abstract – mentation attributes, as illustrated on the left of the diagram. The hierarchy of the

abstract conditions of state is effectively aggregations of data-manifestations that are uniquely interpreted by the Mind and the Brain.
The epistemic data are manifested with unique nano-scale spatio-temporal signatures. Just as in the triangle of knowledge, the spatio-temporal signatures of data are integrated upwards to generate information, knowledge and wisdom.

13.3.3 Neurobiology for concept testing

Post-2000 systems biology has confirmed through Brain imaging, brain wave analysis, and Ctand Functional MRI scans that these spatio-temporal signatures are scientifically proven and measurable at the nano-scale.

Their ongoing aggregation becomes more visible and they can be characterized by the same "Abstract – attributes" that this Project has proffered as the epistemic and molecular glue. Ground breaking neurobiological research by Meeks and Jeste (2010) have confirmed that there is a Neurobiology of all human thought and Mind – Brian – behavior interactions.

Importantly, their neurobiological explanation of wisdom directly applies to the manifestation of this Projects portfolio of suggested "Abstraction – attributes".

13.3.4 The Neurobiology of Abstractions and the Mind

The arguments presented in this concept – test Chapter are therefore grounded on the "seeding" of the Abstract – attributes with Nature's building blocks. This epistemic seeding of all inputs, processing variables, and all outcomes delivers Nature's innovations in the human life – form. We argue that the epistemic seeding of the 98% DNA molecule – in – action is the "Mind".

13.3.5 The Mind and the Brain

In the context of the Boisot I-space, we offer an explanation of the distinction of the Mind and the Brain. The Brain stores the representation of brain – functions in the neuronal architecture of hemispheres, lobes, clusters, tissues and finally in its brain cells – the 100 billion neurons.

Inside each of these cells is the DNA molecule with its 1.8% protein coding genes and its 98% DNA meta-gene capacity which we argue is the Mind. Post-2000 systems Biology provides scientific proof that the 98% DNA interactions are the real meta – management system of all human thought and behaviors.

13.3.6 Renaissance of Strategy-making by the Mind

We argue that the Mind meta-manages and epistemically seeds all inputs, processing variables, and neuronal outcomes to generate all behavior, including strategy-making for eGID-SME relevance.

Hence we argue that all Pre-2000 building blocks need to be epistemically seeded with the Mind's portfolio of abstract – strategy – making catalytic attributes. We argue that this systematic seeding would result in the epistemic Renaissance of all Pre-2000 and Post-2000 concepts for strategy-making.

We also argue that the Model being presented for testing will deliver that Renaissance. Further, the complexity and the phenomena of eGID and the PESTE forces are the result of the Renaissance of the Mind's seeding in the Post-2000 business landscape.

13.3.7 The Neurobiology of strategy-making

The key driving initiator and regulator of the Neurobiological-based Bio-inspiration is the Paradigm Shift that substitutes neuro-protein ecologies and neuro-epigenetic catalysts in place of generic proteins in the Bio-mimicry Model (considered up to Chapter 12).

Scientific researh on an almost daily basis confirms that all human behavior are the direct result of conscous and unconscious actions from the Mind and the Brain, In every case epgenetic catalysts initiate the Behavior chain with the following activities:

(i) Epigenetic factors act as triggers on the Neuro-Protein-coding genes within the neurons of the Brain;s anatomy
(ii) Neuro-proteins are expressed by these Neuron-resident genes
(iii) Neuro-proteins travel down the axons and dendrites of the Brain's neurons to create "Synapses" or release points or communication sites of the neurons
(iv) Other neuro-proteins released as a result of the epigenetic signals travel as "neuro-transmitters" from one neuron to the next via the synaptic connections of the adjoining dendrites of the neurons present in different and function-specifc areas of the brain's anatomy
(v) The released Neuro-transmitters being proteins, utilize the nano-scale "convergence-abstraction" mechanisms on receptor sites in the post-synaptic neuron
(vi) Changes to the post-synaptic neuronal cell result in its membrane becoming instantly reactive and selectively addmitting or relesing bio-chemicals into or out of the neuron cell
(vii) The Bio-chemical cross-flows create changes in the electro-negitivity status of the cell with respect tot the surrounding environments
(viii) As a result bio-electrical charges are developed to the level where the Neuron "fires" its signals down it saxonal circuits to other functional areas forming part of the Brain-behavior chain
(ix) Feed-back signals on the effectiveness of the neuro-transmitter-generated signals make further refinement and adaptation to the above chain of activities.
(x) The scale, scope and dynamics of the above neuron-mediated actions is achieved when groups of neurons within dedicated areas of the brain co9llectively aggregate their "neuronal firing" for control over all behavioral end-points, such as muscles, organs, and other human functions.

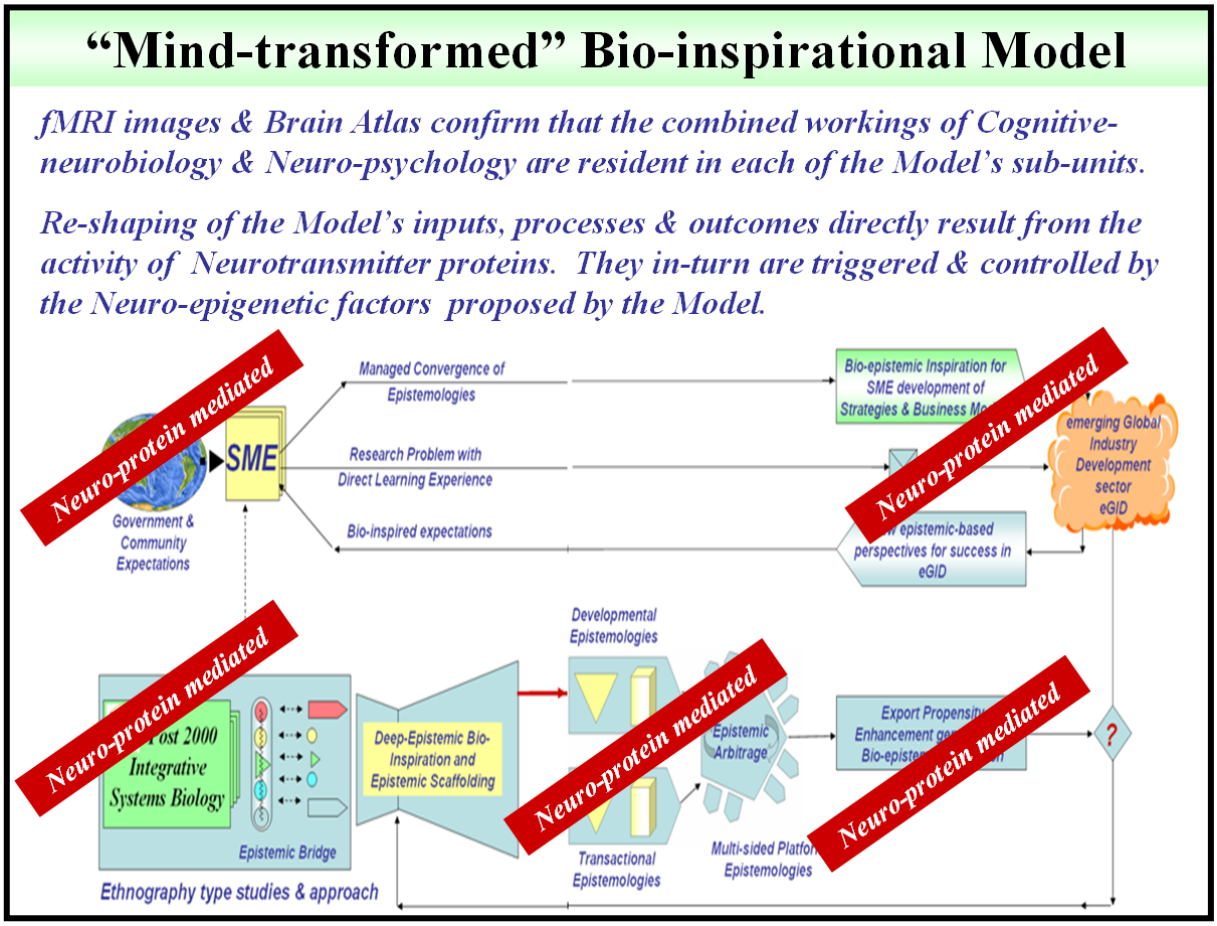


Figure 13.5 The Paradigm Shift to Neurobiology-based Proteins for epistemic exemplars

It is in this context that Figure 13.5 seeks to illustrate the predominance of the neurobiology of all human though and cognitive behavior. The Models' Paradigm Shift therefore involves using the lessons of the 98% DNA in its control of 1.8% DNA (which takes place in the Central Nervous System as well as in the Peripheral Nervous System) as the direct adaptor and transformer of new and Pre-2000 strategies, resources, reports, and findings..

13.3.8 Validity of the Paradigm Shift to Neurobiology

Lessons from Post-2000 Systems Biology and its Post-2000 version of Neurobiology have similarly achieved paradigm shifts from the global scientific community. A range of globally-collaborative projects are transforming understandings in Cognitive Psychology and Behavioural Psychology. Strategy-making is a sub-set of business psychology and behaviour and hence the justification to seek validation from the scientific research findings from global projects such as:

(i) ENCODE – the Encyclopaedia of DNA Functional Elements
(ii) Decade of the Mind research in the 2010-2020 period
(iii) Decade of the Brain – research conducted in the 1990-2000 decade
(iv) Human Connectome Project – with its focus on the connections made by the Brains Neurons and its synapses
(v) Human Genome Project's spin-off research that focuses on the 98% DNA that had earlier been termed "dark and junk" DNA

(vi) EMERGENCE – the European Unions attempt to mobilize and establish the intellectual foundations and an intellectual platform for the use of new findings in neurobiology for mechatronics and metabolic engineering and new innovations in bio-engineering.

13.3.9 Epistemic Convergence of Neurobiology, Molecular & Cellular Biology

Forty years of research by the 2000 Nobel laureate Professor Eric Kandel of Columbia University has confirmed the ubiquitous effects of neuro-proteins on all human behavior – conscious and that of which we are unaware (because of their automated response).

The Paradigm Shift in Post-2000 Systems Biology enables the lessons on Bio-epistemic Control and Catalysis from the 98% DNA to be applied to Neuro-strategy making. The 22-bit microRNA fragments from generic proteomics can be specifically applied to the Brain's chemistry and functioning.

In the ecologies of the Brain's ecosystem, the 98& epistemic catalysts of the Bio-mimicry Model can be equally applied to the Brain's cells - the neurons and the mechanisms to shut off or "silence" the production of the brain proteins and their down-stream neuronal connections that eventually are manifested in behavior.

13.3.10 Stimuli Mind Brain Behavior Chain

The elegance in this 98% DNA method of control is its intervention in the Stimulit-Mind-Brain-Behavior chain. The Paradigm Shift to the Neurobiological context extends the attachment mechanisms and the control mechanisms to the entire 1.8% of the human genome's proteins that are expressed in the neuronal ecosystem and its constituent ecologies of perception, memory, reflection, decision making, reward systems, and other functions of human cognition.

The entire molecular and cellular and developmental and transactional machinery and operations taking place form the Stimuli-Mind-Brain-Behavior chain is thereby controlled by the 98% DNA's Functional Elements. In the Paradigm Shift, the Model seeks to capture lessons and benefits from the strategy-making correlates of these brain-chemical controlling 98% DNA catalysts.

The Concept Test and validation therefore translates into testing the elements of the Mind-Brain-Behavior Chain, as illustrated in Figure 13.5.

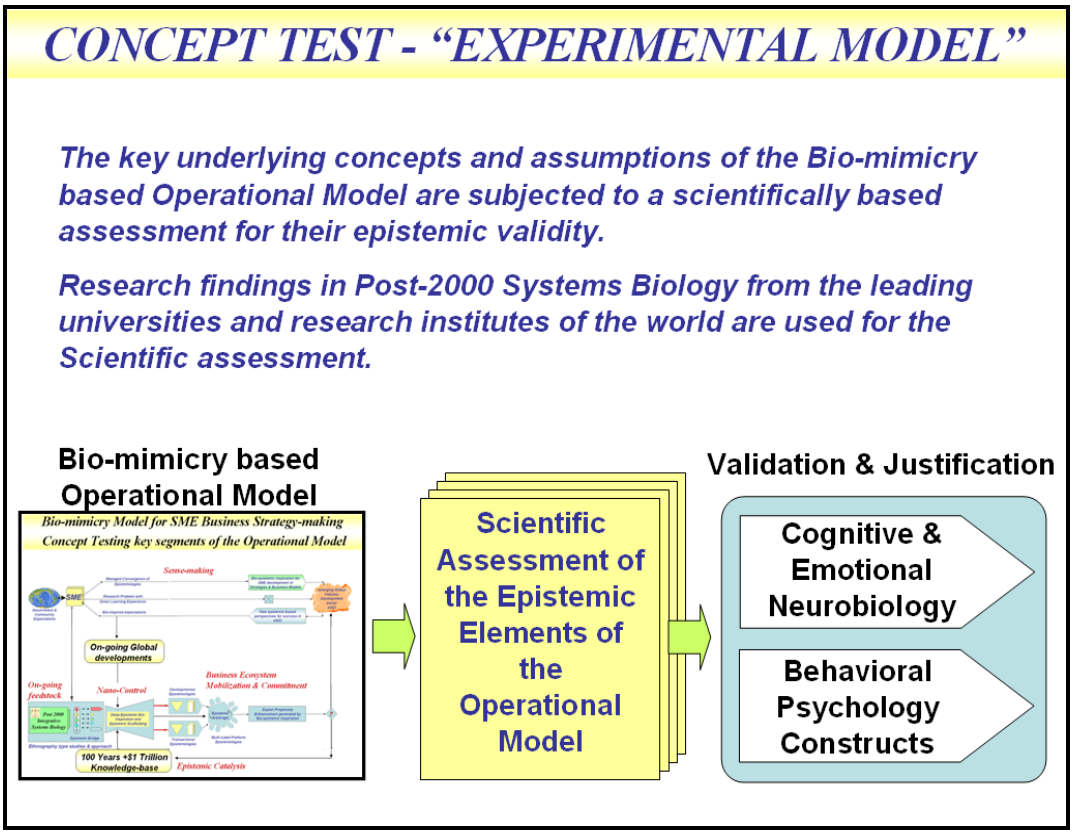


Figure 13.5 Mind Brain Behavior chain testing and validation methodology

Figure 13.5 illustrates the Experimental Model for testing the epistemic validity and justification of the Bio-inspired Operational Model's Behavior Chain. On the left of the diagram is the Bio-mimicry Model and in the middle are the new Neuro-biological contexts of the Paradigm Shift. The right of the diagram illustrates the expected Behavioral Outcomes that are being validated.

13.4 Neurobiology of Cognition-Conceptual testing with the Paradigm Shift

Figure 13.6 provides a simplified representation of the Neural Circuits involved with several of the Brain's anatomical and functional segments that are involved with cognition, decision-making and the fulfillment of the Mind-Brain-behavior-chain.

Post-2000 technologies for "Brain Activation Maps" are continuously being developed with the result that Brain Scans and Functional MRI can conclusively confirm the impacts of neuro-proteins and their 98% DNA nano-scale controllers in dedicated sections and clusters of the brain.

Post-2000 understandings in the disciplines of neurobiology and cognitive and behavioral psychology also confirm that these identified areas are conclusively linked to the delivery of the functions of cognition, perception, pattern-recognition, emotion, memory, learning, and response to stimuli take place in these dedicated circuits and neuronal clusters.

Their spatio-temporal convergence and the progressive integration and simultaneous and differentials deliver co-activity as part of the chain of responses in decision-making and behavior, such as that required for the epistemic challenge in Post-2000 relevant strategy-making.

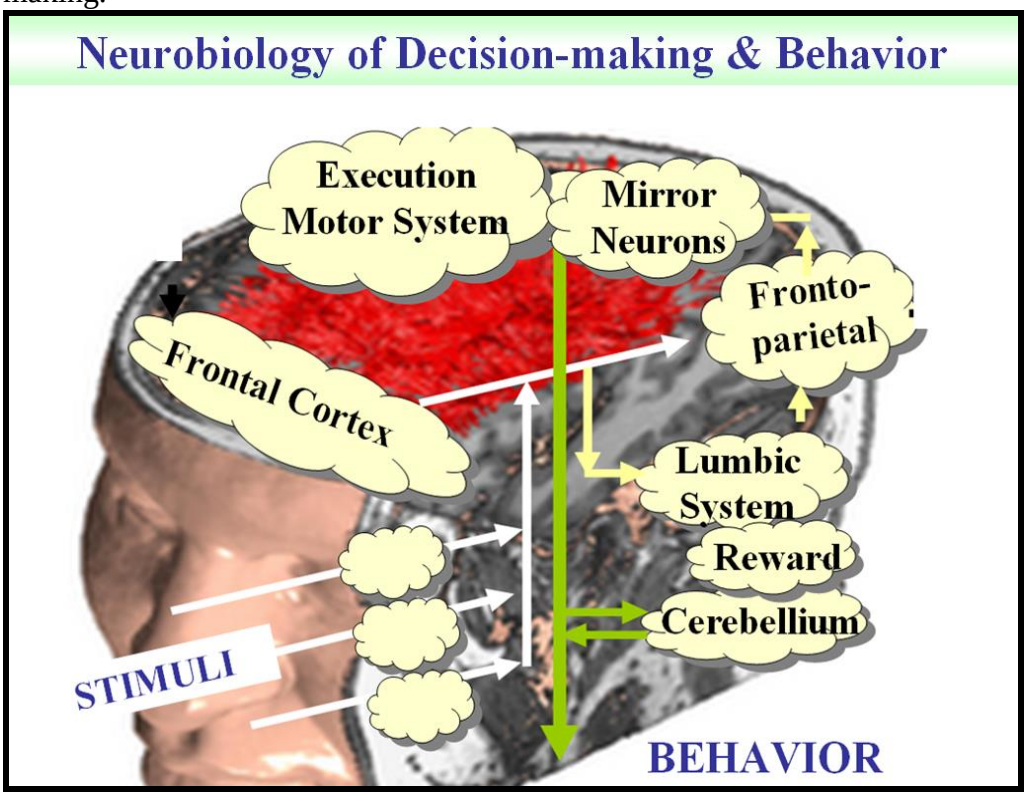


Figure 13.6 Neural Mapping for Bio-inspired Strategy-making behavior

13.4.1 Neuronal Correlates of the Bio-inspired Epistemic landscape

The neuranatomical zones in 3-dimensions form the epistemic landscape for the exercise and expression and manifestation of knowledge and behavioral outcomes.
The Frontal Cortex for example evaluates situations, the options and the cognitive challenges that involve the present and the future. The Frontal Cortex also develops a portfolio of options which can then be on-sent to the Fronto-parietal neural zone (top-right of the diagram). Further research and scientific analysis from the sciences of Neurbiology, Neurology, and Neur-pathologies confirm that presented options and signals from the Frontal Cortex are integrated with signals from Inter-neurons of the neural circuits in adjoining or dispersed locations in the neuronal landscape.

13.4.2 Neuroprotein dynamics in the Brain's epistemic landscape

Protein signals are also delivered to and from these clusters and neural circuits that represent associated and antecedent events and memory. Proteins also interact with the several local neural circuits contributing to the decision-making stage in partial, intermediate or total fulfillment stages.

13.4.3 Functional epistemic stations and repositories

In the Brain's epistemic landscape for example, the functions of memory and learning are represented by the Lumbic System (lower right of the diagram) are delivered by the Hippocampus and the Amygdala. Adjacent of the Limbic System is the Basal Ganglia in which neural circuits are developed for "Reward Systems" associated with the decision-making and behavior. Neuro-signals of the decisions actually made after these considerations are then transmitted to the Pre-motor Neural circuits and then finally to the Motor System, for execution. Feedback and fine control are provided on the execution by the Cerebellum and the Reward System that forms part of the Lumbic System. Feed-back and updating of the events are managed by the on-going signals received from the sensory organs and the sensors on the Central Nervous System.

13.4.4 Conceptual testing from the 100 Trillion neurobiological perspective for Bio-inspired Strategy-making

The purpose of the Figure 13.6 is to illustrate in simplified form that the Bio-mimicry epistemic parallels are grounded in neurobiology. Neural Circuits are associated with each of the functional groups of protein-protein interactions that are required for all human activity – in conscious or un-conscious mode. These neuro-proteins that are responsible for the dynamics of the neural circuits. The neuro-proteins activate clusters of other neural circuits in cascading, and concurrent patterns delivered through the "Synaptic Plasticity" that makes and breaks the connections that fire the clusters of neuron cells.

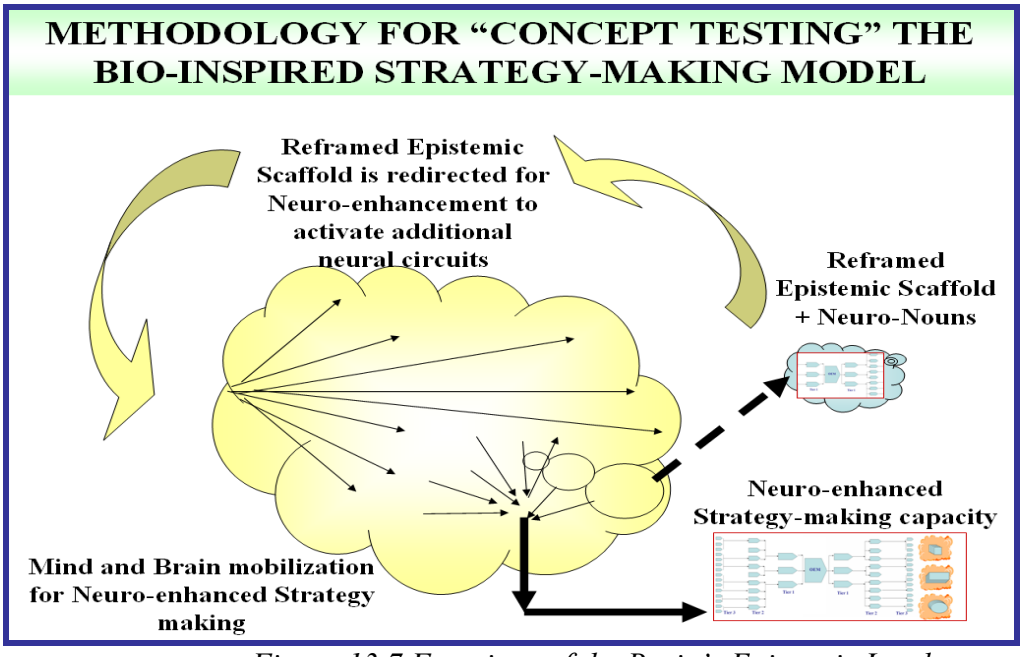


Figure 13.7 Functions of the Brain's Epistemic Landscape

The dominant issue is that the sub-activities between the landscape's clusters and the neuro-proteins are required for the strategy-making process. It is nothing other than one specialized function that is developed by the human brain, among its 100 trillion ecosystem of neurons.

13.5 Concept testing from 100 Trillion perspectives

The human brain consists of over 100 Billion neurons that are strategically located in areas of the brain that can deliver functional efficiences and speed of attention, perception, sense-making, consideration, memory, learning, decision-making, and execution for the end-states or the end-conditions of behavior. These include controlled outcomes in muscle movement in time, scale and scope to generate the visibile repressntations of thouht and decisions in the Brain-behavior chain.

Each fo the 100 Billion neurons posseses potential to be supplied with multiple neuro-protein collection / discharge points at the end of their dendrites. The neuro-tansmitters pass through these dendrites at teminations known as synapses. They can be up to 10,000 to 15,000 sysnpses for each neuron.

Teken together the 100 Billion x 10,000 synaptic connections form the network of neuronal circuits or connections that can generate over 100 Trillion "neuronal signatures"

13.5.1 Neuro-biological Ecosystem with multiple "Thematic" ecologies

The Brain's epistemic landscape has been acknowledged as the most prolific and complex of systems in the world. This is because each of the 100 billion neuron cells that may form dynamic clusters, do so by the use of an average of 10,000 synaptic connections with each other. The clusters that are observable under the Post-2000 nano-scale instruments can only provide snapshots of these dynamic connections. For the purpose of this Research Project evidence is sufficient that such groups of neurons and their dynamic synapses form thematic functions of connectable memories, decision making machinery, points of deliberation, reward collection, awaress zones, learning centres, reference points, flight or flee decision-making preparatory stations, signaling and supply of energy and behavior controlling actions to the Peripheral Nervous System.

13.5.2 Near 100% Expression or all of the 1.8% DNA are activated in the Brain's ecologies

Research by the Allen Brain Institute confirms that almost 100% of all of the DNA's protein coding genes are expressed in the human brain. This is profoundly important not only because it is the only organ in which all of the Protein Coding dynamics take place, but also because the Protein related activities are directly mapped with brain functioning and the Stimuli-Mind-Brain-behavior chain.

Importantly therefore all of the Inputs, Processing, and Outcomes required for strategy-making (like all other cognitive activities) must take place consciously or automatically in the brain's

epistemic landscape. It is in this context that the Project seeks to validate the Model by testing the validity of the Model's engine and its catalysts as being compatible and integratable with the input, processing and outcome fulfillment functions of the brain's thematic zones and ecologies.

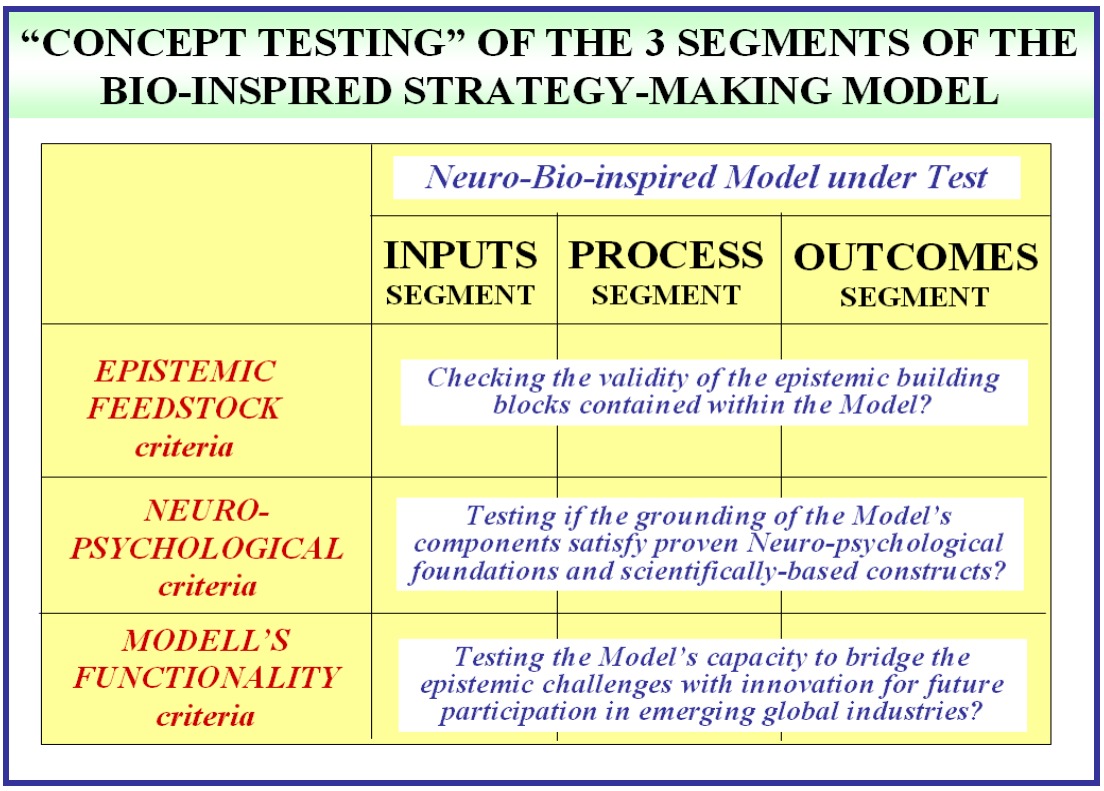


Figure 13.8 – Testing ground for validating Model's epistemic feed-stock, engine and catalysts

Post-2000 Neurobiology is trending to confirm that every aspect of the brain-behavior chain is dedicated with its own neuronal signature. The 100 Trillion combinations offers an adequate resource-base to allocate such neturonal signatures to the all human behavioral activities.

At the minimum, research in biology confirms that every episode and scenario stored in the memory and learning zones of the human brain are directly the result of such neturonal signatures.

It is in this context that the case can be made that every resource-input, model, finding, framework, etc from pre-2000 and Post-2000 strategy-making blcoks must possess a dedicated neuronal signature. Not unlike their digital correlate of RFID tags, these neuronal entities can be identified, recalled, adapted, condtolled, modified and integrated with epigenetic-catalyst neuro-transmitter systems.

13.6 Neurobiology of Stimuli and Attention

Inputs as the Epistemic stimuli for strategy making result from

(i) External sources (eg PESTE macro-economic and eGID industry forces, and publication –reports etc) and calls for SME strategy-making, and

(ii) Internal sources (eg Learning and Memory and the Mind's management of cognitive Psychology, etc)

All of these inputs are biologically transformed by the Central Neurons System (CNS) and the Peripheral Nervous System (PNS) into bio-chemicals and bio-chemical – electric potential.

Neuronal coorelates of these bio-chemicals are the neurotransmitters, neurotrephins and the action potentials that convert these inputs for processing by the Mind and the Brain. These inputs elements as illustrated below are then seeded with the Epistemic – Abstract – attributes for further processing.

13.6.1 Thematic Abstract Attributes

The Mind seeds the inputs with the attributes that can involve multiple conditions of state. These thematic attributes with their unique geometries achieve convergence with complementary inputs in cascades of aggregation.

Carson 2011 confirms both the inherent validity of the active functioning and the dynamics of external stimuli contributions to the required Screening, Filtering/ Awareness Building of strategy-making building blocks from the feed-stock of the stimuli.

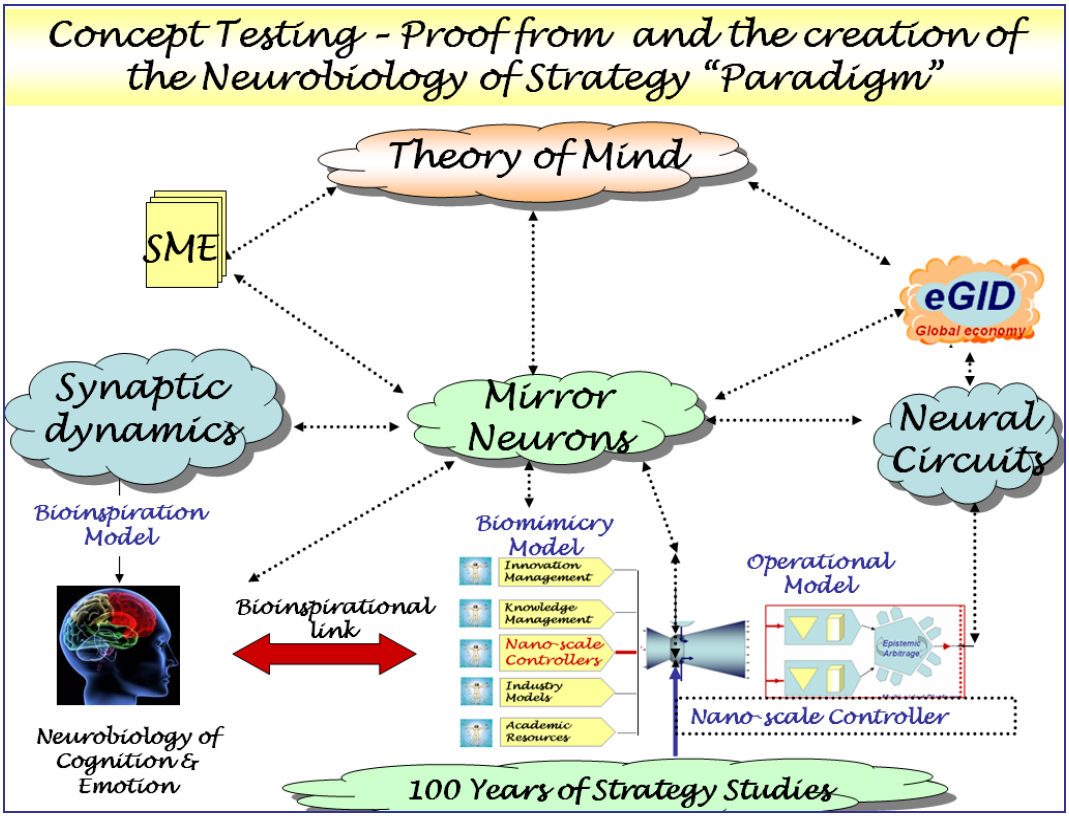


Figure 13.9 – Thematic seeding of Abstraction – Attributes within Inputs

13.6.2 Epistemic feedstock – differentiating the epistemic building blocks

Figure 13.10 illustrates how the Model's Convergence-Abstract entities or attributions can be applied to differentailly utilize strategy-making resources, reports and findings, etc., that could be of rigour and relevance for SME strategy–making.

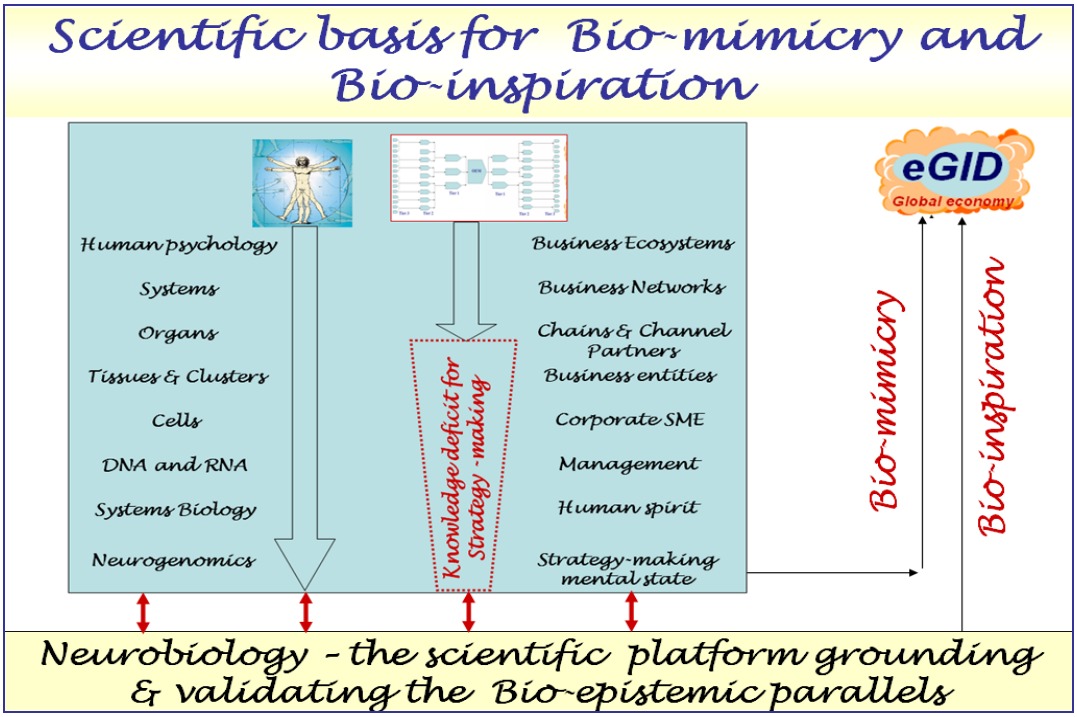


Figure 13.10 – Neuro –Transformation of Inputs

On the extreme right of the diagram are 2 types of outcomes possible from the Model.
In the inner-righ are the Models contributions to basic cognition and understanding. These are the contributions that can be achieved from the Bio-inspired and Proteomic-metaphor-based version of the Model (developed in Chaper 9-12).

On the far right is the Bio-inspired version of the Model's effectiveness. Here direct connection is obtained between the Brain-Mind's actions and their direct applciation to strategic-thinking.

In the epigenetic lessons from Proteomics, the Model relies upon the power of the living universal metaphor between strategy-making and protein-making.

It is argued that the Model's dual capacity is a key confirmation of its strength to cover all strategy-making challenges.

13.6.3 Lexical connection of the Abstraction – Attributes

The portfolio of suggested Abstraction – Attributes used in the Project Model is directly connected with the Neurobiology of Language and Communication. Shapiro, Mottaghy, Schiller, Poeppel, Flqg, Muller,Caramazza and Krause (2005) argue for the use of neural neural correlates of nouns and verbs in cognition.

Word dissociations with different grammatical categories are well established in neuropsychology and are being corroborated with evidence from brain imaging. For example Shapiro et al. report on a PET study designed to reveal the anatomical correlates of grammatical processes involving nouns and verbs. German-speaking subjects were asked to produce either plural and singular nouns, or first-person plural and singular verbs. Verbs, relative to nouns, activated a left frontal cortical network, while the opposite contrast (nouns–verbs) showed greater activation in temporal regions bilaterally.

Similar patterns emerged when subjects performed the task with pseudo words used as nouns or as verbs. These results converge with findings from lesion studies and suggest that grammatical category is an important dimension of organization for knowledge of language in the brain.

13.6.4 Thematic attribute seeding with 98% DNA activation

The bio-chemical correlates of the inputs are transformed by the Mind's seeding of thematic abstract – attributes.

Figure 13.11 illustrates the manner in which portions of the Mind's 98% DNA molecule uses microRNA activation and control mechanisms to encourage or curtail the respective desirable or harmful seeding.

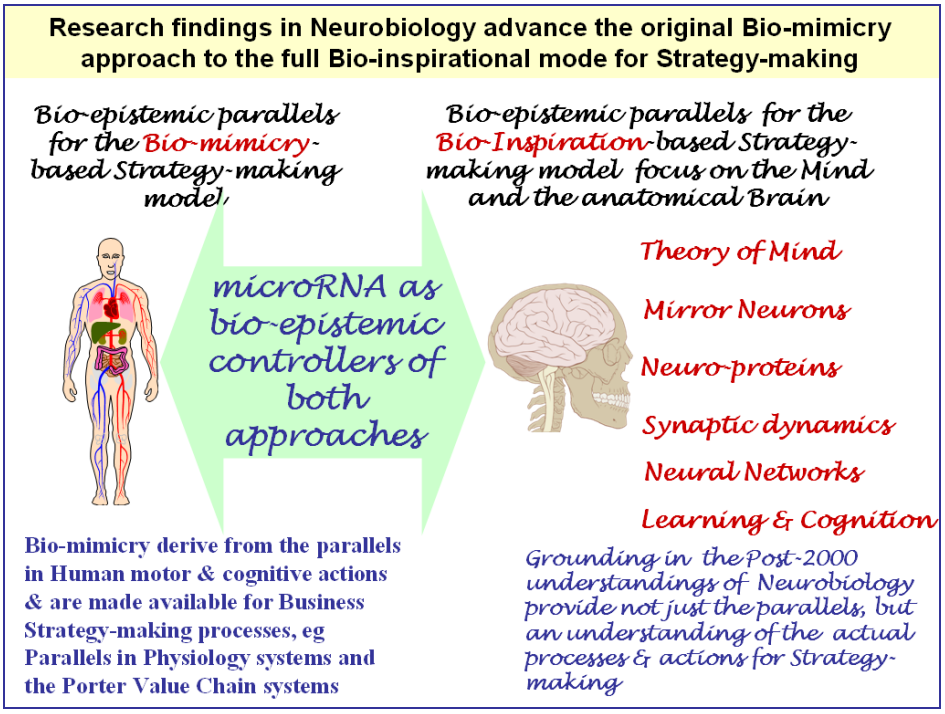


Figure 13.11 – Mind's 98% DNA activation mechanism

MicroRNA mobilizing and conditioning of Pre-2000 and Post-2000 knowledge delivers connectivity for Neuro-processing in strategy making. Kenichi Ohmae (1982) predicted this Mind for the mobilizing of individual epistemic elements in strategy making

13.6.5 Neurobiology of Appreciative Inquiry

The psychology positive reinforcement and celebrating the success of past experiences have long been understood as the mechanism by which the brain can rewire itself, in the phenomenon known as neuroplasticity. But until recently, Pre-2000 Neuroscientists didn't know what causes gray matter to become plastic, to begin changing. Breakthrough research by a team at MIT's Picower Institute for Learning and Memory has documented one type of environmental feedback that triggers plasticity: success. Equally important and somewhat surprising: Its opposite, failure, has no impact.

Research by Professor Miller of MIT confirms that the link to environmental feedback (eg external and internal) is crucial to improving how people teach and motivate because it's a big part of how we learn.

13.7 Neurobiology of Cognitive Processing

The Model's functioning requires the neurobiologically seeded Inputs to be processed. In the Model the processing takes place in the illustrated "Epistemic Engine" of Figure 13.12.

13.7.1 Synaptogenesis with strategy – making

Post – 2000 research in Neurobiology provides the grounding and the justification for the strategy – making processing stage. The disciplines of Synapgenesis and Neuroplasticity underpin the Engine's mechanisms of strategy-making that involves:

(i) Inductive and deductive thinking
(ii) Seeding and aggregation, with a priori knowledge
(iii) Mental modeling
(iv) Concept and sub-concept modeling and thematic integration

13.7.2 Convergence of Epistemologies based on Epistemic Catalysts

Post-2000 research in Neurogenomics provides the scientific proof that the Abstraction – Attributes after repeated embedding, aggregation and cycles of integration emerge into the observable conditions of state.

Functional MRI, brain scans, and DNA-chip array analysis all confirm that thematic conditions of identity, visibility, pattern recognition, integrity and agility emerge from the geometric –based convergence mechanisms.

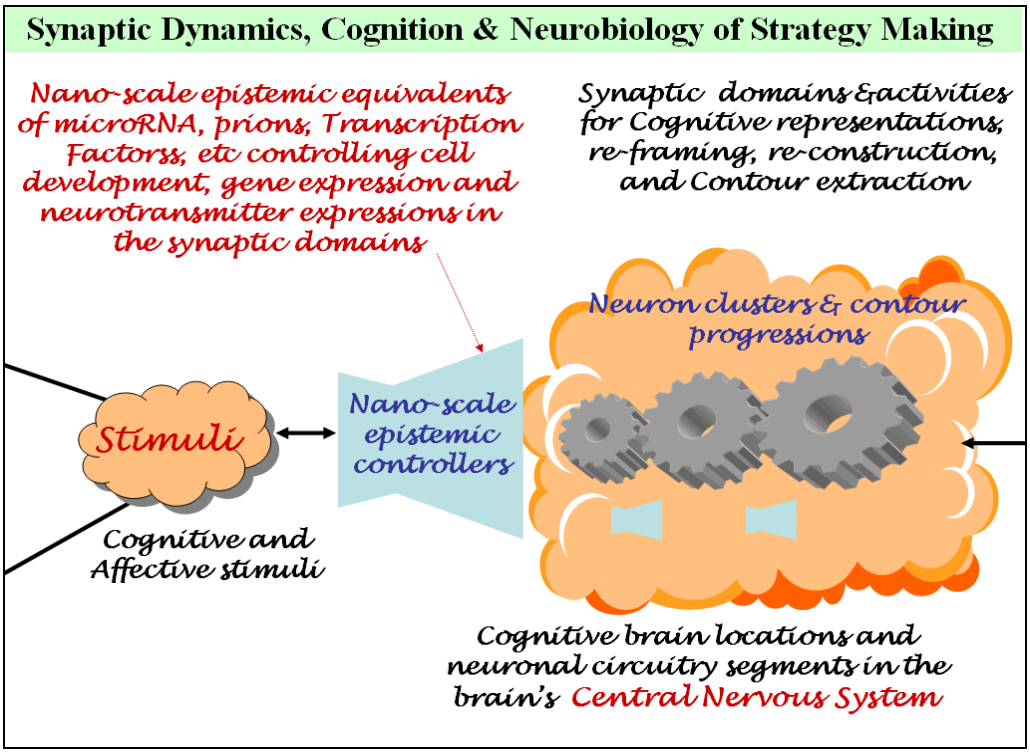


Figure 13.12 – Mind's Epistemic Engine for strategy – making

13.7.3 Emergence of macro-scale Epistemic themes from Abstract – Attributes

The Epistemic Engine's functioning is justified by the action of the Mind in directing the selections and the neural pathways to be implemented by the brain's infrastructure and its 100 Trillion synaptic connections. As a result, the Neuro-biology based Bio-inspired framework exactly complies with the criteria and findings of research by Faucannier and Turner of Standford University (2011) . Their research in Conceptual Integration Theory and Conceptual Blending among the distributed cognitive domains using

- Analogy
- Recursion
- Mental Modelling
- Framing
- Concept categorization

They have also argued for the use of modern neurobiological understandings to justify the sub-components of these modes as epistemic catalysts with:

- Functional MRI brain scans and molecular electronics
- the proof of the neural circuitry and neuro-plasticity
- Neural ecologies
- Theory of Mind applied to the full chain of strategy-making
- Minds Eye and Mental Visualization
- Mirror Neuron mechanisms, etc

13.8 Epistemic Catalysis with Synaptogenesis

The net outcomes from the Epistemic Engine are the Renaissance in thinking and the use of Pre-2000 and Post-2000 resources from multiple domains.

13.8.1 Renaissance and use of Theory of Mind

Theory of Mind is a new the new competency for strategy-making – using the microRNA epistemic equivalents with the Theory of Mind competency for strategy-making. Theory of Mind is the mentalizing capacity or ability to understand the mental states or mental processes of others and their linkage to one's own mental processes. Post-2000 studies in neurobiology have confirmed the validity of this psychological construct with the result of functional MRI brain-scan images and the associations with specific neuroanotomical locations.

Theory of Mind as a psychological construct seeks to explain one's ability to understand within others their mental states of perception, intentions, beliefs, desires and knowledge. It is also believed to be a vital part of social intelligence in the context of working and interactions with agents in a goal-directed environment.

In the context of strategy-making, a Theory of Mind capacity can assist in visualizing the goal seeking mind-set of others, anticipate courses of action, and learn through example and the imitation of others. Theory of Mind is in effect is a cognitive capacity that can assist SMEs better learn and interact with the global economy.

The neurobiological basis of the Theory of Mind construct is grounded on the same molecular and cellular genomics of proteins and nano-scale controllers within the cells making up the epistemic ecossyee. The only variation is that the proteins are neuro-proteins (neurotransmitters) , and the dynamics of control are the neurotrophin transcription factor regulators, and the prions, and the microRNAs silencing mechanisms.

A key issue for SME strategy-making is that the mental processes of cognition and epistemic deeding with their Abstraction – Attributes.

13.8.2 Visibility and understanding of PESTE/ eGID phenomonologies

The Neurobiology of behavior provides visibility for viewing the reported activities of the PESTE forces and the eGID business landscape, through the use of the Epistemic Engine and its portfolio of Epistemic Catalysts.

As illustrated in Figure 13.13 dispersed and disparate (in theory) domains can be integrated by the Model's use of the Epistemic catalysts. In the transient and dynamically changing outcomes,

the embedded catalysts can be provide evidence of dominant patterns, justification, trends, drivers, etc in the phenomena of the marcro-economic PESTE forces.

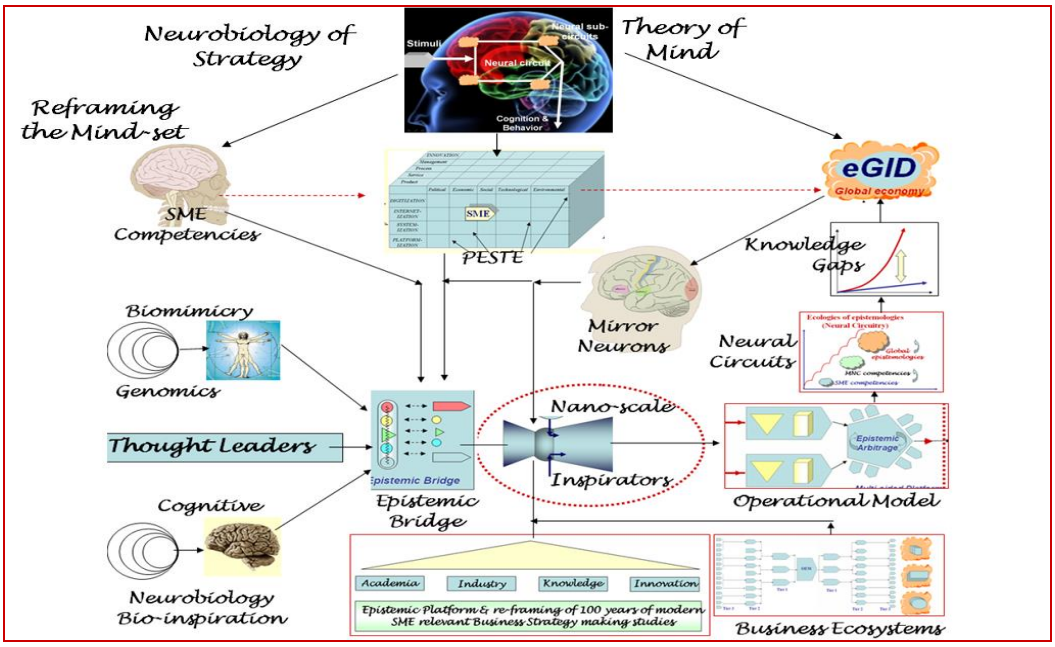


Figure 13.13 – Applying Theory of Mind to PESTE and eGID phenomena

13.9 Connecting SMEs with eGID landscape

Neurobiological and related scientific findings confirm that all behaviors is bio-chemical at its conceptual, developmental and communication stages – before their manifestation in physical artifacts or commercial entities or transactions.

13.9.1 Connecting SMEs with the Global eGID phenomena

eGID is a cauldron of Bio-chemicals in the making. Epistemic Renaissance with the concept of Theory of Mind (Tom) provides visibility of the catalytic transformations of the Nano-scale controllers that are embedded within the minds of the global eGID business ecosystem members and the rest of the PESTE stakeholders.

The integration of the Strategy-model's bio-epistemic nano-scale controllers in conjunction with the Theory of Mind Mind's Renaissance provides a powerful epistemic position for SME sense-making. A unique understanding can be created within the mental states of competitors, regulators, partners, investors, and other stakeholders. From this unique perspectives, new strategies can be created by SMEs that can address the "accountability, identity, mobility, reliability, visibility" type issues that are embedded within the phenomena of eGID.

13.9.2 Failure to use Epistemic Catalysts

Through Functional MRI brain scanning, TOM is characterized by cascades of biological pathways. The failure to possess a TOM is a cognitive and social deficit – a failure to understand the drivers that are the drivers of behavior within the target markets of SME strategy-making.

TOM deficit impairment prevents perception making or mind-blindness – lack understanding of the basis of behavior from the eGID and PESTE global communities with which SME strategy-making must recognize. The importance of TOM is that there is now a biological basis for TOM. For example, Mind-blindness is a functional-MRI finding of persons with social deficits in managing their behavior towards strategic goals and intents.

13.9.3 Visualizing eGID for SME strategy – making

Mentalizing – ascribing intentionality is a key requirement in each of the stages of transactions, or developmental or ecosystem building work that SME strategy-making must involve or seek to have involved. Again scientific research confirms the Model's correlates of microRNA equivalents expands the level of inferences, pattern recognition and trends in eGID landscape. TOM cognitive ability is required to understand others as intentional agents – their beliefs, feelings, desires, reward systems, hope and intentions that cause action which results in the eGID phenomena.

13.9.4 Making sense of global epistemologies

In the context for SME – eGID strategy – making TOM helps understand behavior predict behavior, interpret minds in terms of the theoretical concepts of intentional states such as beliefs and desires, people intentions and actions, interpret ascriptions of contnetful mental states and understandthe social world in terms of the mental states.

13.10 Value-adding strategic lessons for eGID participation

With the scientific grounding on the neurobiology of behavior, it is argued that SMEs should be capable of interpreting and utilizing value-adding concept framing from the target eGID landscape. SMEs can utilize the Epistemic portfolio of Abstraction – attributes to analyse reported activities occurring in eGID and in the PESTE landscape.

This element of the Model's capabilities are scientifically grounded in the neurobiology of "Mirror Neurons".

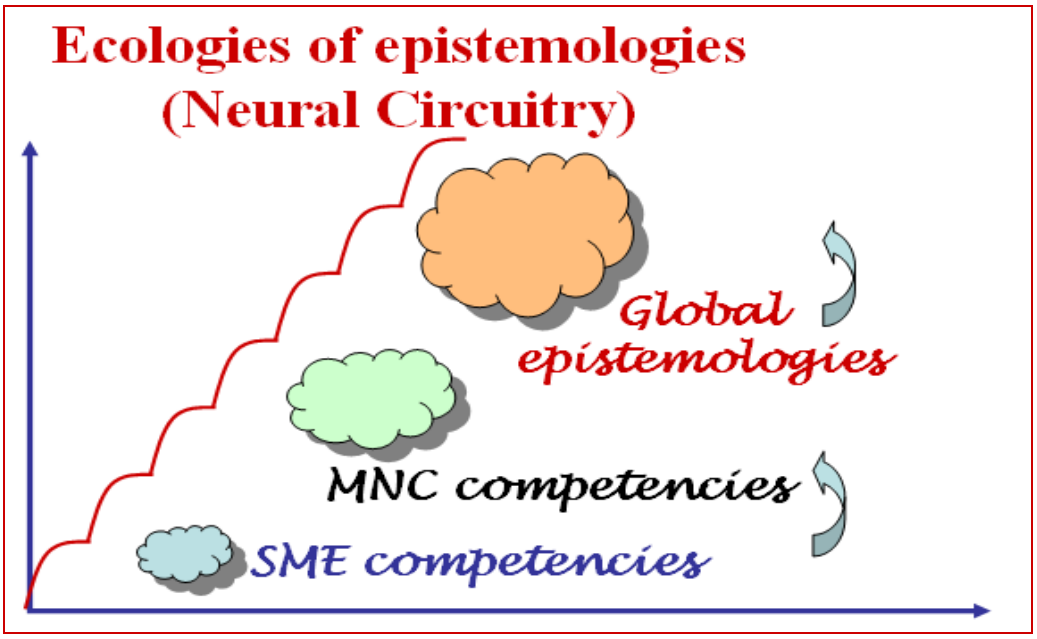


Figure 13.14 – Applying Mirror Neurons for Accelerated Learning

13.10.1 Mirror Neurons – the fast track learning with integrated reward systems

Their bio-inspiration allows SMEs to benefit from the use of the same neural circuits that are common to both observed action and the implemented or executed action. Since the lessons from mirror neuron circuits involve neuroproteins and neuroprotein controllers (with their microRNA equivalents) they offer SMEs opportunities for accelerated learning. All SMEs need to do is to analyse eGID activities in the lens of the Epistemic catalysts.

13.10.2 Accelerated Leaning for SME – eGID connectivity

The combination of Mirro Neurons with the Epistemic Catalysts offer SMEs a scientifically proven methodology for the required accelerated learning for eGID connectivity.

Figure 13.4 illustrates the Pre-2000 version of the Project's Research Questions. Disparate and dispersed domains are perceived to exist. By embedding the Model's Abstraction – Attributes to observed activities in the global landscape, their lessons can be transplanted for SME utilization.

SME strategy-making's outcomes again result from the Renaissance and transplantation of scientifically proven neurobiologies.

13.11 Neurobiology of Wisdom for strategy-making

In this section we present the case that the Epistemic Exemplars and Catalysts within the Bio-inspired Model are actually the manifestation of wisdom. Also we argue that their embedding,

shaping and re-transformations within Pre-2000 building blocks deliver a Renaissance and a new paradigm shift in SME strategy-making that is grounded in the Neurobiology of wisdom.

13.11.1 Scientific basis for Renaissance with Wisdom attributes

Jeste and Meeks 2009 – have confirmed that functional MRI (fMRI) signatures have been recorded for the different Wisdom sub-elements. These sub-elements are contained within the most common definitions of Wisdom that have been produced by a range of psychologists and medical researchers.

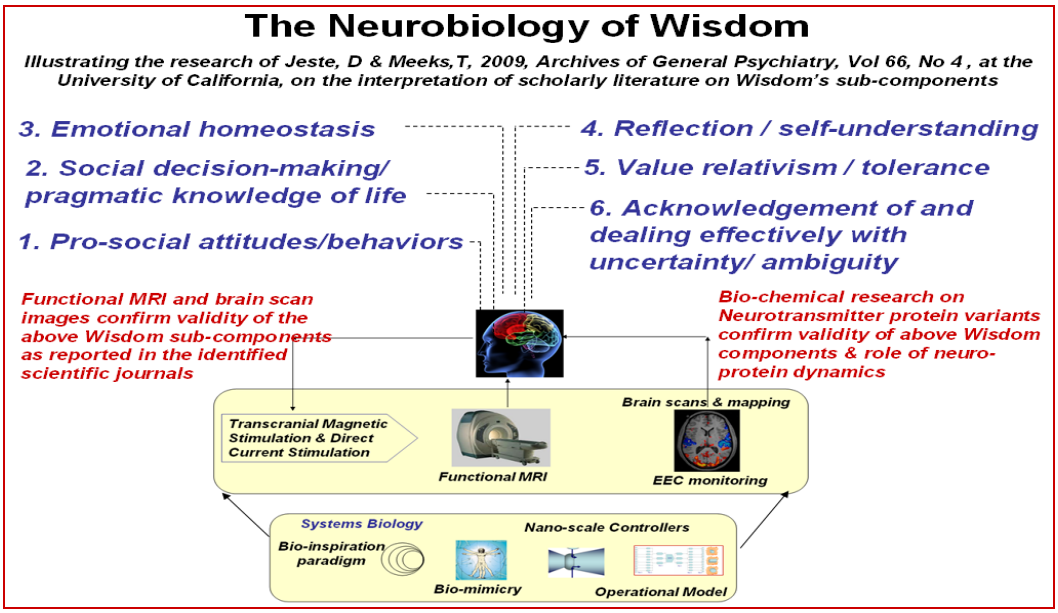


Figure 13.15 – Embedding Wisdom attributes generates Renaissance in strategy-making

According to Jeste and Meeks 2009, Functional neuroimaging permits exploration of neural correlates of complex psychological attributes such as those proposed to comprise wisdom. The cortex and limbic regions figure prominently in several wisdom subcomponents such as emotional regulation, decision making, and value relativism.

13.11.2 Neurobiology of Wisdom – managing the Epistemic Catalysts and the Meta-strategic oversight

The epistemic overlaps between the Model's catalysts and the Neurobiological correlates of Wisdom provides the Model with a scientific grounding to generate innovations. Figure 13.16 illustrates how Pre-2000 building blocks that are embedded with the thematic catalysts can introduce elements of wisdom for SME success.

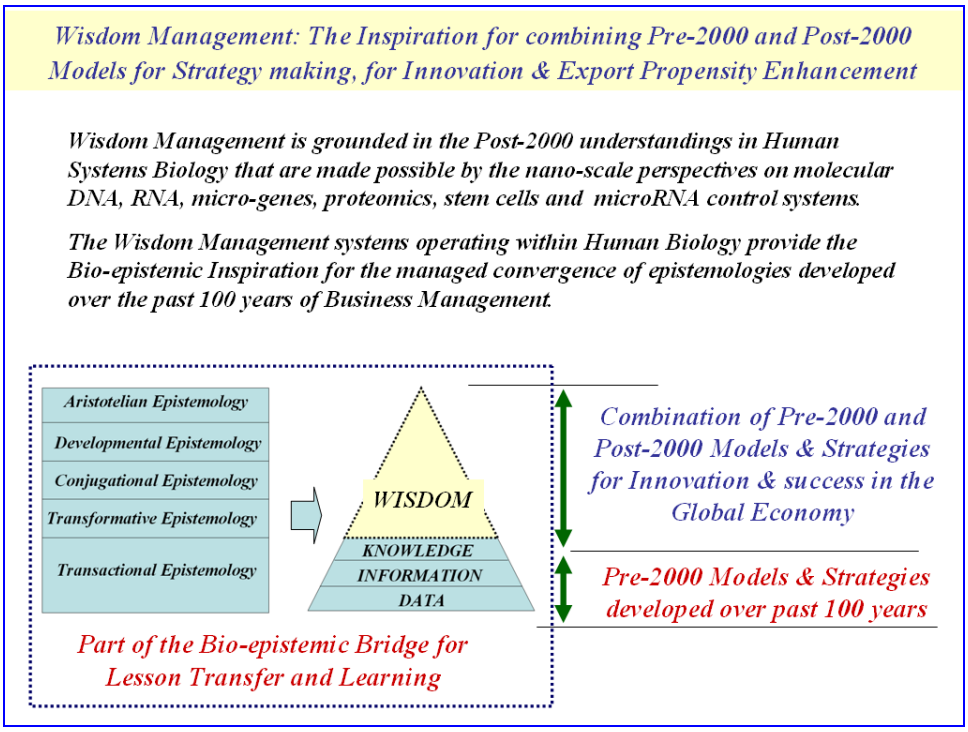


Figure 13.16 – Mobilizing Wisdom for SME-eGID strategic success

13.11.3 Scientific basis for Wisdom generating catalysts

The functionality of the Model's thematic catalysts is supported by research at the University of Southern California's Brain and Creativity institute. fMRI corroboration of the integral nature between mind, talk and action. Research by Professor Aziz-Zadeh (2007) confirms that the brain's premotor cortex shows the same activity pattern when subjects observe an action as when they hear words describing the same action.

The fMRI neuro-imaging additionally offered evidence for the existence of "mirror neuron" systems that activate both when a person performs a task and when the person watches someone else perform the task. The fMRI research demonstrates the intimate linkage and association between the way one hears, talks and thinks about actions involving the bio-inspired catalysts and the neural machinery that supports those action-behaviors involving catalyst embedded strategies.

A key feature of the fMRI research also supported the need for the neuro-concepts to be single word concepts representing action. Sentacnes and long worded metaphors did not achieve the same neural-action linkage.

Associative learning is therefore the key. Once the linkage between the portfolio of Model's thematic catalysts and action-behaviors are established for strategy making, the motor-cortex becomes conditioned to deliver the Renaissance neuro-strategy making chain per Figure 13.17.

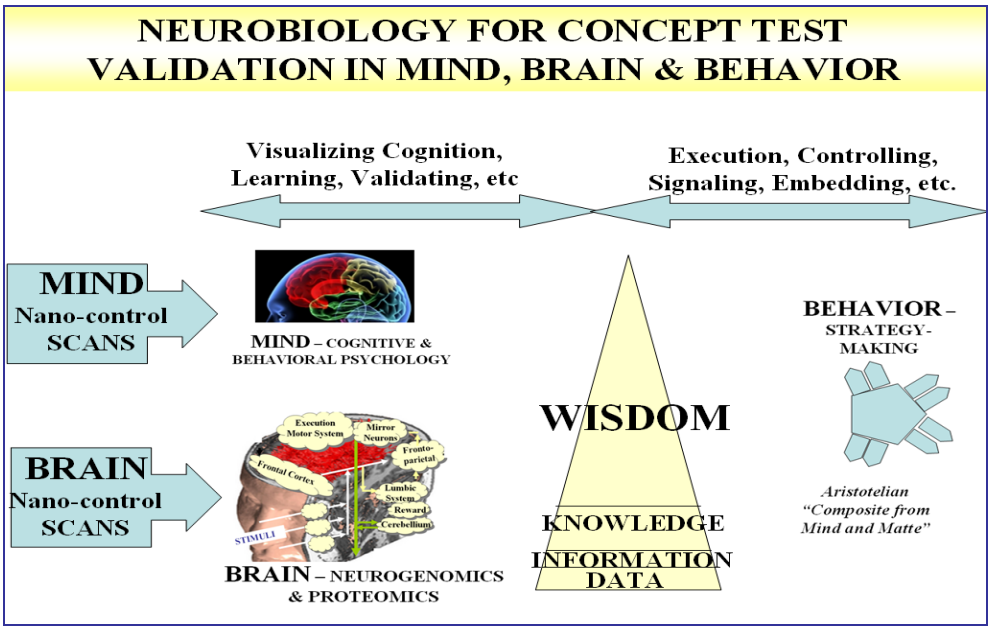


Figure 13.17 – The delivery of Wisdom for SME strategy – making

13.12 The Neurobiology of strategy on strategy

The concept of strategy-making is tested against one of the most highly acclaimed books on strategy making by Professors Vijau Govindrajan and Chris Trimble. Praise and recommendations on the strategic value of the book have been recorded from world leaders in thought-making and in business. They include the CEOs of General Electric, PepsiCo, WalMart, HomeDepot, the John Deere company, Infosys Techologies of India, and academic leaders in strategic studies such as Professor Kathellen Eisenhardt of Stanford University and Professors Tushman and Lawrence of Harvard. The key factor is that their strategy-making insights have been acknowledged by a wide spectrum of industries. A strong case of relevance to SME needs therefore exists with their research findings and rules on strategy-making

13.12.1 Strategy – on – Strategy Paradigm Criteria

In their book "10 Rules for Strategic Innovators" they address the strategic challenges for working in the Post-2000 era of business. Their research findings are totally focused on the typical case of a Pre-2000 business or "core" business which must move into the new Post-2000 landscape of intense change and challenge. In their prescription of the required strategies they outline 10 key strategic issues that must be addressed for any firm wishing to advance into the knowledge economy.

The Pre- and Post-2000 business transformation problems are the same strategic challenges that confront SME strategy-making for SMEs moving from Pre-2000 mindsets and advancing to the eGID landscape. The strategic content and the similar context provides the justification for testing the Bio-mimicry model against the "10 Rules for Strategic Innovators".

13.12.2 Meta – Concept Testing of Bio-inspired strategy- on- strategy making

In this section we conclude the Concept Testing at the meta-level – ie to determine if the Bio-inspired Catalysts can be directly applied to conventional legacy-generated strategy-making blocks.

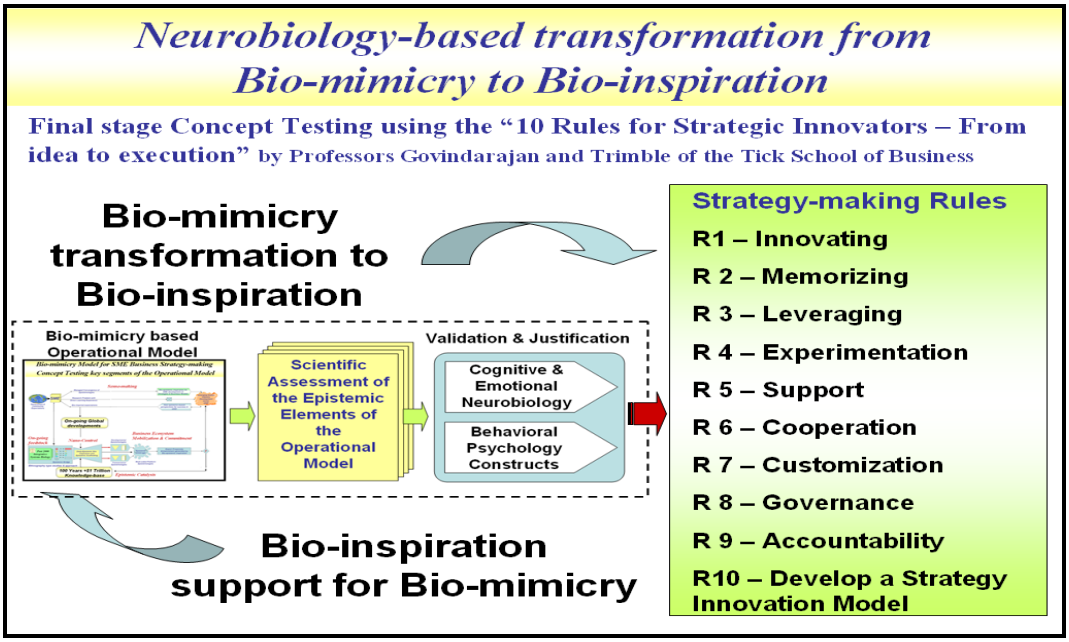


Figure 13.18 – Strategy for strategy Paradigm meta capacity from Bio-inspiration

Figure 13.18 illustrates how meta-strategy-making the bio-mimicry framework is enhanced into a "Bio-inspirational" paradigm. On the left of the diagram is the bio-mimicry model which although supported by an almost unlimited portfolio of epistemic parallels does need to be justified and validated. The Concept Testing regime introduced neurobiology criteria and behavioral psychology constructs (centre of diagram) on the bio-mimicry hypothesis. The test successes have identified the potential for its transformation into the bio-inspirational paradigm. This final biology-business test regime (right) provides the final validation and advancement of the Model to the next level of testing.

In the Table below we present the case that the elements of the Bio-mimicry Model and or its Nano-scale bio-epistemic Controllers can provide a suitable response to the challenges embedded within the "10 Rules for Strategic Innovators".

13.12.3 Paradigm Test Results

Strategic Rules and Requirements from the conceptual research of Govindrajan and Trimble, 2005	*Epistemic capacity of the Bio-mimicry's Operational Model and its Nano-scale Epistemic Controllers to address the rules*

Rule 1 – Innovative ideas are only the start of the business journey	
(i) Strategies must recognize that "idea generation" needs both a base and follow up	The Bio-mimicry Model recognizes the value in the 100 years of business strategy-studies and places new ideas firmly within the context of the innovation cycle and its integration with its corporate business plans. The unique value of the Bio-mimicry Model however is the treatment that is offered to new ideas. The Model offers a portfolio of epistemic elements that can be embedded with the new ideas. Irrespective of whether they are in product or process technologies, the portfolio of "nano-controllers" can launch the innovative idea into the real-world. The Controllers can make connections with other innovations and make links with the downstream activities and procedures of entrepreneurship and investment
(ii)Strategy-making needs to go beyond trends and offering solutions to superficial observations	The Bio-mimicry Model by design seeks deep epistemic understanding of the driving and causal mechanisms associated with strategy-making. The Model specifically seeks to understand the reasons for the observed phenomena to be achieved with the use of the portfolio of Nano-controllers. For example, the appearance of an orderly progression and transfer of goods from one location in the supply chain to the next and across national boundaries can be traced t the use of nano-control "identify" markers, in the form of RFID tags. The needs of the individual within the broad expanses of a customer base can similarly be tracked using the integration of nano-control tags of "identity, mobility, and reliability". The portfolio of Nano-controllers provides the lens through which deeper understanding can be achieved fro strategy-making
(iii)Strategy-making must leverage ideas from intra-industry and inter-industry sources	The Bio-mimicry Model draws inspiration from the innovations in the fields of Systems Biology, molecular genomics, stem cell biology, regenerative medicine, and nano-technology utilization by the global pharmaceutical industry. Their research outlines the scope and scale for lessons from protein synthesis and how these proteins are instrumental in developing the human life form at various stages of life. The Bio-mimicry provides almost total coverage of the issues related to strategy-making among any

	organization when its well being and its challenges are compared with the new ways of control that are part of Nature's structural and transactional systems
(iv)Organizational DNA needs to be established	The Model specifically creates an epistemic DNA segment for SME strategy-making. It is achieved by building into the decision making the business "DNA-genes" of Wisdom. The Nano-controllers are the new and missing "Wisdom" link. Pre-2000 business strategy-studies generally lacked the specific inclusion of, and the emphasis on the Nano-controllers as a dedicated structural DNA segment. The situation of the existence of Pre-2000 limitations and the new addition of Post-2000 knowledge is common situation that exists with both Business Strategy-making and Human Systems Biology. RNA genomics (Nano-scale controllers) were the missing link in several segments of the Pre-2000 strategic studies. The emphasis on ruthless cost control and "sticking to the knitting" was offered as cutting-edge strategy in the 1970-80 era, in parallel with the DNA studies in the same period. Both possessed an almost total disregard for the strategic, supportive, and controlling elements provided by RNA genomics (Nano-controllers).
(v)Strategic thinking is an imperative for success in the Post-2000 era of business	The Model introduces and implants strategic thinking by its focus on the Nano-controllers. The Model emphasizes that they should be a structural part of the any strategy as well as a controlling factor.
Rule 2 – Managing Organizational Memory with challenges to extract its power-dynamics	
(i) Need a system to forget the older less productive methods in exchange for the new thinking	The epistemic Model's exemplars and catalyst assists in identifying and embedding value adding themes that generate connectivity, while identifying activities that do not contribute to Customer Value Propositions
(ii)Need to subject existing processes to the criteria of market-demand and dynamics before forgetting	The Thematic Epistemic Catalysts are directly related to market demands and Post-2000 Customer Value Propositions that are deliverable through the integrated contributions from business ecosystem membership
(iii)Need a system that differentiates and provides	The portfolio of thematic epistemic exemplars and catalysts provides SMEs with a virtual check-list of

different perspectives on candidates for "forgetting"	issues and functions that will force the abandonment of identified issues of irrelevance and replace them with current technologies or new innovative fulfillment approaches
Rule 3 – Leveraging Assets and Capabilities for Post-2000 strategic reach	
(i) Need a system to help borrow from ecosystem members	The Model's Epistemic Catalysts provide the functional attachment mechanisms and the thematic categorizations for additive, adaptive and integrative strategy-making
(ii) Need a system to learn	Chapter 11 provided details of the Learning potential facilitated by the use of the Model's engine and catalysts
(iii)Develop competencies to facilitate borrowing	Competency development is assisted by the availability of thematic catalysts. SMEs only need to learn to embed the themes within Pre-2000 strategy-making building blocks.
(iv)Develop a system for appraising lenders and motivating them to lend	The Model extends the relationship building potential beyond lending and into business ecosystem partnerships for mutual benefit
Rule 4 – Conduct Strategic Experimentation for critical unknowns	
(i) Develop learning strategies inside the firm	The value of Pre-2000 strategy making activities such as Scenario Planning are boosted by the ready focus on themes linked to the fulfillment of the entire value chain
(ii)Offer assistance for buyers to better appreciate the strategies and the product-services of the firm	The Epistemic Catalysts and their chains of value adding constructs offer significant potential to link their deliverables to Customer Value Propositions that are reflections and manifestations of the new catalytic functions and deliverables
(iii)Need to experiment with key ideas	High level productivity can be expected from the Model's use with the Appreciative Inquiry and the Scenario Planning protocols
Rule 5 –New growth firms and strategic approaches must be quarantined and supported from scratch	
(i) Need to balance Learning, Borrowing and Forgetting	The Model is designed for achieving Learning Ascent Routines
(ii)Learn to confront and adapt to uncertainty	The Thematic Catalysts facilitate consideration and focus on issues of uncertainty and remedial strategic approaches are offered in the Model's recommendations
(iii) Develop new competencies for Learning,	The Model's epistemic exemplar delivers a continuum for parallel consideration with any

Borrowing and Forgetting	Learning continuum
Rule 6 –Learning to Manage Tensions is the "job one" task of management	By its focus on epistemic themes of operational value, the adverse effects of creative tension are diminished – allowing positive and motivational effects to reinforce innovation development
(i) Learn to identify the factors causing tension	This is categorized and abstracted by the Model's catalysts in a ready-to-use manner
(ii)Learn to mange the spotted tension makers	As above
(iii) Control the disruption of the tension making processes	As above
Rule 7 –Need to develop a customized Planning Process	
(i) Develop the Organizational DNA for planning	The Model's capacity to deliver and focus attention on Abstract concepts facilitate practical planning outcomes
(ii)Integrate learning into corporate objectives	The elucidation of Abstract concepts into usable constructs delivers the required integration by linkage with Corporate Value Systems and vision
(iii)Develop synergistic dynamics between the new and the old	The Model is specifically designed to value add Pre-2000 building blocks by adaptation and enhancement with Post-2000 value adding relevance
(iv)Ensure predictions are not rigid as a measure of control	The portfolio of Catalysts and exemplars offers SMEs a set of guidelines that can be prioritized for value-made judgments
Rule 8 –Manage Interest, Influence, informal competition and the politics of disruption	
(i) Learn to identify competing interests among stakeholders	The Model's epistemic catalysts provide SMEs with the scaffold to identify patterns and trends among stakeholders and competitors and to enhance the required offerings with deeper fulfillment of the thematic catalysts
(ii) Manage competing interests among stakeholders	The Charter of the Epistemic catalysts provide all stakeholder with a common reference and a clarity of their roles and functions within the Model's framework which can avoid unnecessary competition that could otherwise result without this level of clarity. Additionally the clarity in the knowledge of shared responsibilities and mutual dependencies can assist each member enhance their repective expertise and domain for collaborative advantage and strategy-development with a higher order level of service
(iii) Recognize contexts for competing	PESTE forces and competencies and inputs from stakeholders can be interpreted with greater levels of confidence with the assistance of the Model's catalysts. The Epistemic engine for embedding their

	value-creating functions within Pre-2000 building blocks can generate strategies beyond recognition of the contexts and game rules for competition
(iv)Extinguish disruptive influences	The clarity in the assignment of shared responsibilities enables ecosystem contributions to be aligned and synchronized with maximum effect using the Epistemic catalytic frames
Rule 9 –Hold new ventures accountable for learning not immediate financial	
(i) Establish the learning timeframe and model	The Research Project's Model offers a usable framework that is energized by the very same lessons and mechanisms utilized by Nature for its successful fulfillment of every human activity. The required Ascent Routines in the Bloom Taxonomy of learning is catalyzed by the epistemic spiral of enhancing understanding and lesson capture from exemplars that are unsurpassed by any other metaphor, in scale or direct relevance to the learning for streategy-making and innovation.
(ii)Monitor the learning performance and progress	As above
(iii) Gain from life experiences	The Model provides an interpretative framework and the highest level of transparency to relate and benefit from the experiences of life – not just the SME but also all other stakeholders. It is for this mechanism that the "Renaissance" of Pre-2000 building blocks and experiences are achieved with Post-2000 relevance.
(iv)Differentiate from conventional planning	The Renaissance of Strategy-making is obtained through the enhancement of Pre-2000 building blocks that have been restrained in the past. Programs such as Appreciative Inquiry and Scenario Planning for example benefit from their renaissance because their operational modules can be enriched with catalytic thinking, and inductive and deductive reasoning that enhances the mechanistic approaches and limits of the Pre-2000 planning protocols
(v)Assess the intensity of the learning challenge	Learning challenges for new strategy-making and innovation are advanced by the embedding of the Epistemic catalysts in each of the modules of the Pre-2000 building blocks, for example the Balance Scorecard (BSc). The Renaissance of their value is generated from the better understanding and learning of how the (BSc) modules are integrated into the catalytic themes and functions of the Bio-inspired Model.
Rule 10 –Develop a Strategic Innovation Model for the firm	

(i) Develop system to manage uncertainty	A direct result of the Renaissance of the Pre-2000 building blocks is the capacity to obtain greater clarity, understanding, and visibility of the Model's abstract concepts. Without this facility the ambiguous challenges within PESTE forces and the reports of the Information Tsunami can be daunting. With the Model their complexity is stripped to reveal the mechanisms of control and opportunity capture for strategy-making.
(ii)Ensure old ideas do not get in the way of new ideas	The Post-2000 strategic value of the Information Tsunami and of the 100 years of Pre-2000 building blocks can be extracted with relative ease with the benefit of the Model's Catalytic framework
(iii)Conduct strategy experiments	The Bio-inspired renaissance of the Scenario Planning building block is ideally suited for embedding the Catalyst together with Post-2000 contexts from the Information Tsunami. The range of conceptual options and strategic directions available to SMEs would be significantly magnified.
(iv)Institutionalize the Learning, Borrowing, Forgetting framework	The Bio-epistemic renaissance of the Boisot I-space for example is achieved by the Model's elucidation and operationalization of the "abstract constructs" of the Z-axis. The correlate of the "rate limiting nutrient" having being fulfilled provides SMEs with a landscape of epistemic locations and launch platforms for strategy-making and innovation.

13.12.4 Results of Meta-level "Strategy-on-Strategy" Tests

The strength of the Paradigm is demonstrated by the Bio-paradigm's capacity to mobilize and deliver convergence from the Mind's capacity to integrate the metaphoric catalysts with Pre-2000 legacy based strategies.

13.13 Conclusions

We reached Chapter 10 from the starting points and the epistemic positions that the bio-epistemic parallels of the convergence-abstraction correlates were significantly strong to help create a "Bio-mimicry-based" strategy-making framework and Operational Model. We subjected the Model's bio-epistemic parallels and the metaphoric catalysts to a range of arguments derived from the lesssons available from scientifically-based testing in genomics, and molecular and cellular biology. In this Chapter we further advanced the testing and specifically applied the DNA lessons from molecualar and cellular to the actual Brain and its neuronal circuits and cognitions.

The findings confirm the validity of the DNA-bio-mimicry based approach to strategy-making. More specifically the Chapter has confirmed the need for the DNA-epigenetic correlates to be an essential requirement as a pre-conditioner of consolidated and adaptive thought and mental behavior. The core benefits resulting from the related Concept Testing are the epistemic justification, development, and elevation of a new bio-inspired paradigm. This is an advance and marked departure from its origianl position as the result of simplistic metaphor-parallels between the DNA-information molecule and the building blocks of business.

The neuronal-foundation of the new Paradigm and its pre-conditioning convergence-abstration attributes offer potential to totally enhance and expand the "bio-mimicry" mechanism with the more powerful "Bio-inspiration" for all mentation and stratgy-making among all stakeholders.

Based on the neuronal-connected confidence, we have extended the scope of the epistemic transformation-potential for the Bio-inspirational Model to be subjected to a further range of tests. These will be conducted in Chapters 14 and 15 in which we seek to determine its potential to provide direct solutions at the meta-level, ie. the business strategy-making context that extends to higher order "Strategy-on-strategy" making and testing.

The successful "strategy-on-strategy" testing if successful is expected to validate the Research Questions and its quest for developing the required platform and pathway of the Model and its functional transformations from Bio-mimicry → Bio-inspiration → Knowledge Gap reduction → Resource adaptation of MNC-centric resources → eGI Strategy-building stages.

13.14 Chapter Summary

In this Chapter we have justified the elevation of the bio-mimicry parallels to the level and role of being a Bio-inspired Paradigm. While Chapters 10-13 justified the Model on the basis of the bio-epistemic parallels, this Chapter has expanded the metaphor and directly linked the strategy-making lessons to a portfolio of new bio-inspired cognitive skills and competencies.

Essentially this Chapter has demonstrated the generative and transformative potential by pre-conditioning and front-end focusing the hihg-order thinking type attributes of the convergence-abstraction correlates.

The epistemic and cognitive validity of the convergence-abstration entities of the Model are being proven and reinforced almost on a daily basis by scientific-based testing from leading researchers in North America, Europe, Australia and Asia. The same lessons of Post-2000 Systems Biology are also confirming the need for and the validity of these convergence-abstraction correlates to attain advance in genomics, proteomics, cellular biology, immunology, cognitive psychology, neurobiology, bio-chemistry, oncology, and stem-cell studies, etc.

The testing in this Chapter has also confirmed the need to "front-end" or achieve an epistemic equivalent of cognitive priming with the bio-inspired convergence-abstraction correlates. The epistemic pre-conditioning is required to not only understand all human behavior but to also formulate new and innovative thinking.

The framework for the role of and importance of the Bio-inspired Paradigm as a pre-conditioner and catalyst for eGI-relevant strategy-making are supported in principle by the research of MIT's Tomasello, Dweck, Silk, Skyrms and Spelke (2009). They argue that two "catalyzing" functions are responsible for the primacy of the human mind, viz (i) the capacity for collectivization of mind, and (ii) the creation of social institutions. Without these two unique traits, it would be impossible for human life form to have survived over the generations.

The availability and functional use of the Convergence-abstraction correlates of the Paradigm and its catalytic pre-conditioning not only satisfy the "cooperative" criteria of Tomasello et al (2009) but also generate the required mental threads, psychological schemas and scripts, epistemic scaffolds and visions. This exactly what the Chapter has argued – that the Model function as the engine for establishing and enacting collective cognition, collaboration, adaptation, wisdom, cooperation, modification and imitation.

Strategy making is but a small sub-set of human culture and human behavior. It is also in this context the Chapter argues that the total-brain's use of the convergence-abstraction correlates justifies and validates its application in the much reduced scope of the Paradigm. The Model simply extends the epistemic pre-conditioning offered by the convergence-abstraction correlates to catalyse and innovate new thinking for SME-eGID success.

From this epistemic vantage point, we advance into Chapter 14 to determine if the Paradigm can satisfy the "perception-generating functions" necessary for SME-eGI innovations, so that the Model can be elevated to the level of a meta-strategy.

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CHAPTER 14 PERCEPTION EVALUATION & RENAISSANCE

14.1 Introduction

In this Chapter we present proof that the demands for Post-2000 SME strategy-making can be effectively managed by the Research Project's Bio-inspiration Model as a result of its grounding in the neurobiology of strategy-making and the neuroscience of Mind-Brain-behavior. In this Chapter we satisfy the issues raised by the Research Question with its focus on Perception-based testing. We argue that the Model posses this capacity for strategy-making requirements of the future. We utilize the challenges as predicted by thought leaders and academic scholars as the experimental perception testing platform. Resulting from this testing regime, the conclusion is reached that the neurobiological grounding of the Model and its nano-scale epistemic catalysts and controllers have together delivered the capacity required to manage the different challenges that the scholars have predicted.

In this Chapter we therefore subject the Model for perception-focused testing against the challenges and stimuli predicted in 6 functionally futuristic test cases. These are representative of the future demands that are expected to be imposed on SMEs for strategy-making with the Research Project's Model. We analyze each of these "future thought leadership" cases in the context of their demands and on the validity of the Model's expected responses from it's neurobiological grounding. In each case we are able to argue that the Model is well positioned to successfully address all of their future challenges.

Following the successful Perception Test, the Model is subjected in Chapter 15 to the final test of the Research Question – with its focus on practical applicability and implementation potential.

14.2 Definition of Terms and Concepts used in this thesis

Stimuli – are defined in the context of demands for strategy-making or functional issues, concepts or demands that are relevant for strategy – making.

Neurobiology of strategy-making – is defined as the genomic, cellular, molecular and proteomic interactions taking place in the Central Nervous System and the Peripheral Nervous System that generate fulfilment of the Stimuli – Mind – Brain Behavior Chain.

98% DNA – is defined in the context of the 98% of the DNA molecule that has been found to be the controlling regulating, transforming and whole of life dynamic platform that manages the 1.8% of the DNA involved with protein – coding genes.

Dark DNA or Junk DNA – are referred to in the context of the Pre-2000 view of the 98% DNA – before its exposition as the key controlling system for the 1.8% DNA involved in the expression of biological protein synthesis.

Genes – are defined in the context of Protein coding knowledge repositories for Nature's building blocks – of structural, hormonal, immunological and bio-catalytic proteins.

The Pre-2000 strategy – making building blocks are considered to be the correlates of the 1.8% DNA Protein coding genes.

Functional Elements – are defined in the context of being Regulatory genes and controlling elements that activate, silence, suppress, enhance the proteomic expressions that result from the 1.8% DNA protein-coding genes.

14.3 Approach and criteria for Perception validation

This universal capacity to handle future challenges and stimuli provides the required validation and "Perception Test" proof of the Model's capacity to deliver strategy-making solutions for both the current time as well as far into the Post-2000 future. In fact this degree of success extends and builds the logical case for the generation of the new paradigm – the Neurobiology of Strategy-making.

14.3.1 Perception Testing validated by capacity to mange challenges and stimuli

The Project's Research has established that the knowledge and wisdom necessary for any cognitive function (including strategy-making) and its resulting behavior are dynamically grounded in neuro-biological science. Cognitive functioning requires the activation of neuro-genomic processes, that are facilitated by the Model's bio-epistemic parallels and catalysis. The physical actions of strategy-making and its parallels with the molecular and cellular developments in the human life-form together form the basis for the Operational Model response by relying upon its neurobiological structure and origin.

14.3.2 Epistemic perspective on the management of Stimuli for Perception Testing

The common neuroscience challenge being addressed by scientific research institutes (in the domains of Neurobiology and Systems Biology) is the biological basis for "consciousness and the mental processes of the Mind and the Brain that finally result in behavior". A key step within this Behavior Chain and pathway is the stage of "perception" to make sense of the stimuli to which we are directly or indirectly exposed. Perception, as a neurological sub-process is an important requirement before decisions are made to act, learn, remember and or accept further feed-back to amend or adapt the initial understandings and decisions under consideration. In cognitive neuroscience, the brain is able to marshal the capabilities of the sensory neurons to provide an accurate representation of the challenges posed by the stimuli before the computation of the required behavior. Special zones in the brain's architecture are responsible for the stimuli-perception stage of cognition. Scientists are continuing to map the regions of the brain's

architecture that is so involved with each of the broad processing stages – starting with perception. In addition to their location in space, scientists acknowledge the need for these zones to be active in their capacity to connect with the associated neurons. Unless there is the epistemic infrastructure for connectivity between the perception group of neurons, the final downstream behavior may be deficient in the demands made by the stimuli.

14.3.3 Experimental set-up for Stimuli-Perception validation

It is in this neurobiological context that the Perception Test is being developed and conducted on the test subject of the "Bio-inspirational Model and its Nano-scale bio-epistemic controllers".

The Perception seeks to determine whether the SME-strategy making Operational Model can manage the portfolio of the stimuli per predictions of the likely demands that will be imposed on Post-2000 global business.

The underlying concept behind the perception testing is shown in Figure 14.1. On the right, we illustrate the "Epistemic Engine" of the Bio-inspirational Model. The Engine is the platform and vehicle in which the epistemic catalysts are embedded into the stimuli (for strategy-making) and the strategy-making building blocks.

The outcomes are the Post-2000 strategic – insights. The richness and innovation levels achieved in the outcomes are dependent upon the epistemic richness of the stimuli, functioning as the epistemic feedstock of the Model's Engine. In the left of diagram, we illustrate the stimuli representing the highest levels of cognition that would be imposed on the Model.

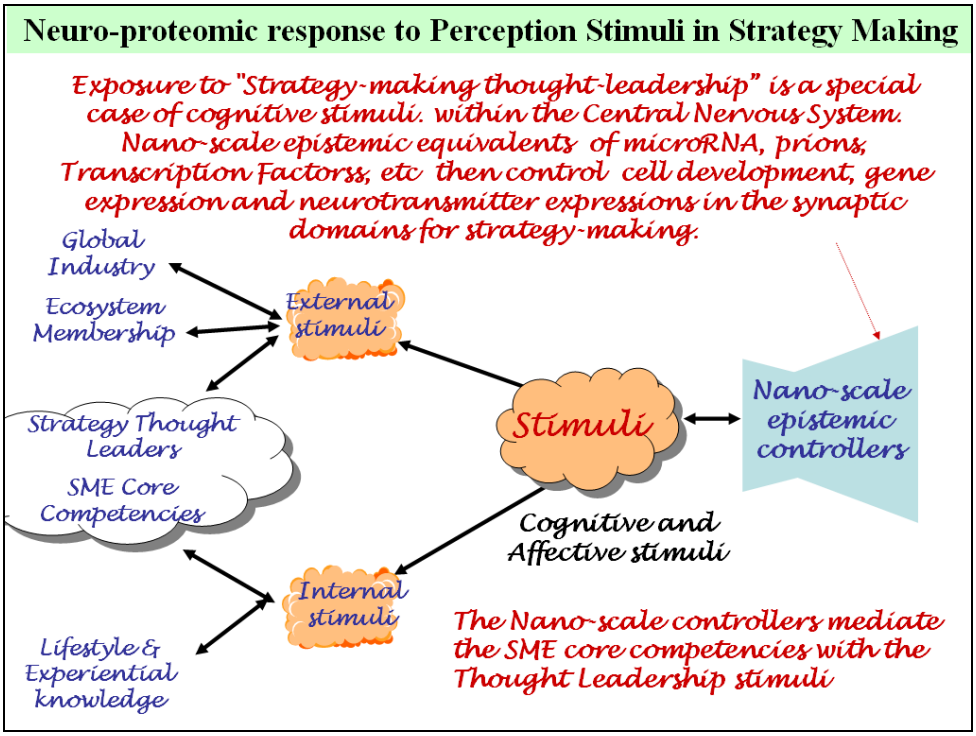


Figure 14.1 – Perception Test Validation

14.4 Methodology for Perception Testing

Perception is the creation and development of an appropriate level and character of response to a stimuli. In the context of the PhD Project, a strategy-making model has been created and to test whether the Model is valid, it is necessary that the Model be subject to a "perception test" with a series of stimuli to determine if the response generated by the model is appropriate to the "Research Question" and also if it gives due recognition to the issues raised within the stimuli.

The Research Question asks if a SME-relevant strategy could be developed which would effectively provide a set of universally applied guidelines, that could manage the changing dynamics of the global economy in which SMEs are forced to function. More specifically the Research Question also sought the determination of whether this universal strategy could address the structural limitations under which SMEs function – with limited resource allocations and a reduced propensity for additional study and learning, beyond the existing levels of personal attention they need to make to their businesses a success.

Finally the Research Question, if it had to be answered with integrity, needed to address the demands and dynamics of the future with the changing needs of society and the changing capacity for customers, partners, regulators, etc around the world being able to change the state of play.

14.4.1 The Challenge of the Future and strategy-making with the expanding Post-2000 Information Tsunami

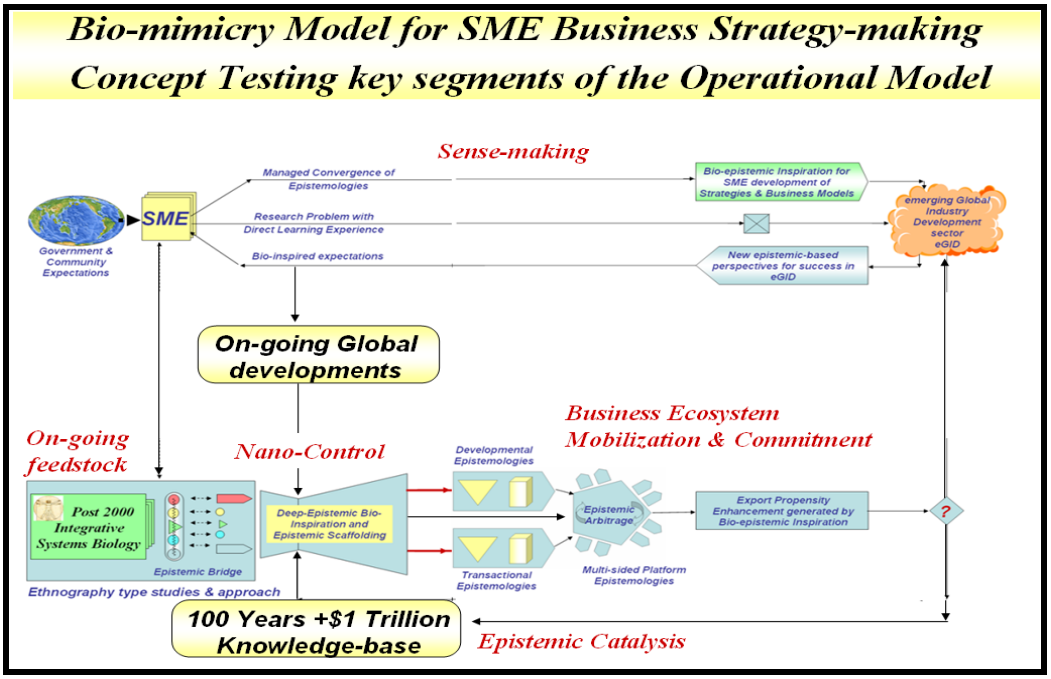


Figure 14.2 – Testing Epistemic stimuli feedstock in the Model

Figure 14.2 illustrates the key elements within the Bio-mimicry derived Operational Model and their epistemic position relative to the objectives of servicing the emerging global industry development sector. The key epistemic elements of the Model are being subjected to "Perception Testing" to determine "response" to the challenges presented. The SME position is represented in the top left of the diagram and the target objective is on the opposite right side of the diagram. The epistemic elements are integrated to enable SMEs to access the global economy through the pathway of the Operational Model, which is at the base of the diagram.

14.4.2 The relationship between Neurobiology and Strategy-making

To understand the Model's capacity for Perception – Response Testing it is necessary to understand the neurobiological and bio-chemical reactions taking place in the Mind – Brain – Behavior chain.

Neurobiology is the science of the information processing that takes place in the brain in response to stimuli. In a simplified manner and directly relating to this Thesis, neurobiology relates to the manner in which information molecules as generated by the brain cells or neurons are embedded within the neurotransmitters before being circulated to specific neural circuits of the brain for information decoding and behavior generation.

Neurobiology provides an explanation of the information management system of the stimuli – Mind Brain system that is managed in real time. The information management cycle can be conceptualized when the sensory cells or neurons are presented with stimuli or signals from the external or internal environment. A dedicated functional area in the brain then implements the "perception" tasks on the stimuli before on-sending a further group of information molecules that represent the sense-making outcomes of the neuronal perception stage. At the pre-final stage, the information molecules then activate "motor neuron" group the implements that provides a further set of information molecules to a different zone of the brain or the muscular system to thereby enact the required and computed behavior. In the case of the brain, the final information molecules are involved the activation of neural circuits associated with learning and memory.
Importantly in the context of the Research Project, the neurobiology of information management provides both the epistemic landscape as well as lessons on the enabling mechanisms used by different groups of brain cells to perceive, navigate, activate and generate feed-back from the different functional segments of the landscape.

It is in this context that the neurobiology of strategy-making can be visualized per Figure 14.3. The epistemic business landscape, of the target eGID sector is in effect the neurobiology of the collection and or the aggregation of strategy-making from the neurobiology of individual business strategists, entrepreneurs, regulators, and business persons including counterpart SMEs. Their collective mindsets are responsible for the ecologies of epistemologies within the eGID landscape.

The neurobiology of human cognition and the neurobiology of the eGID sector must therefore display the same epistemic characteristics, because from an epistemic perspective their only variation is the scale and scope of the range of inputs, processing capabilities and behavior options.

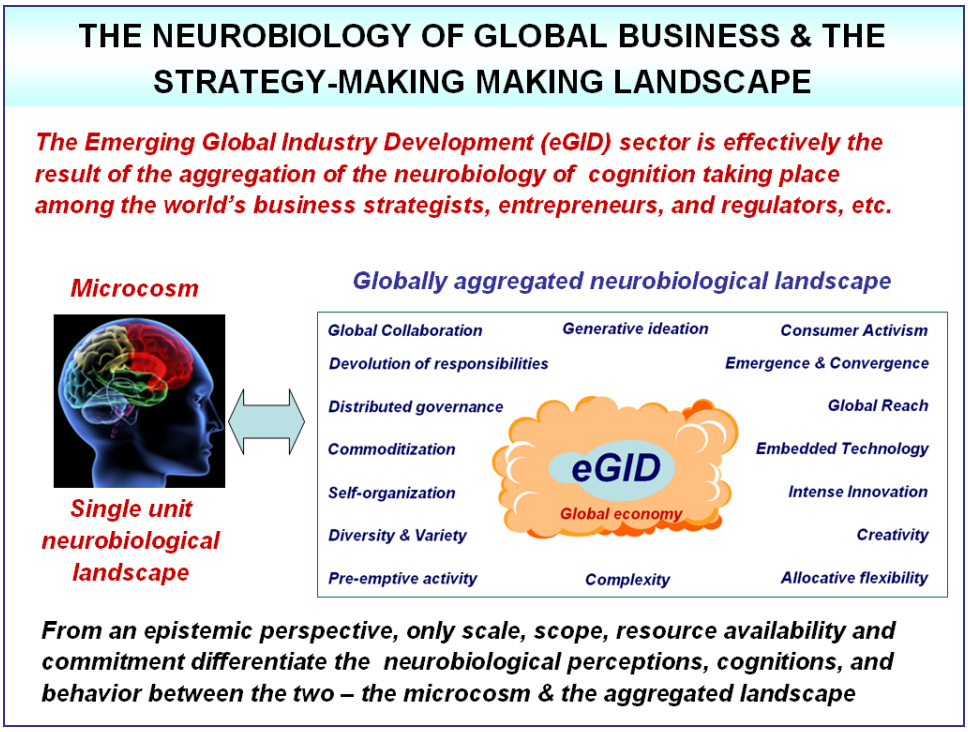


Figure 14.3 – Perception Test Validation

14.4.3 Lessons from the Neurobiology of Cognition for Strategy-making

In effect the study of the neurobiology of cognition provides valuable lessons for the understanding of the aggregated stimuli – Mind – Brain – Behavior chain. The neurobiology of cognition is a microcosm of the activities taking place in the landscape where there is a multitude of participating "neurobiologies of cognition" in action, all taking place at the same time.

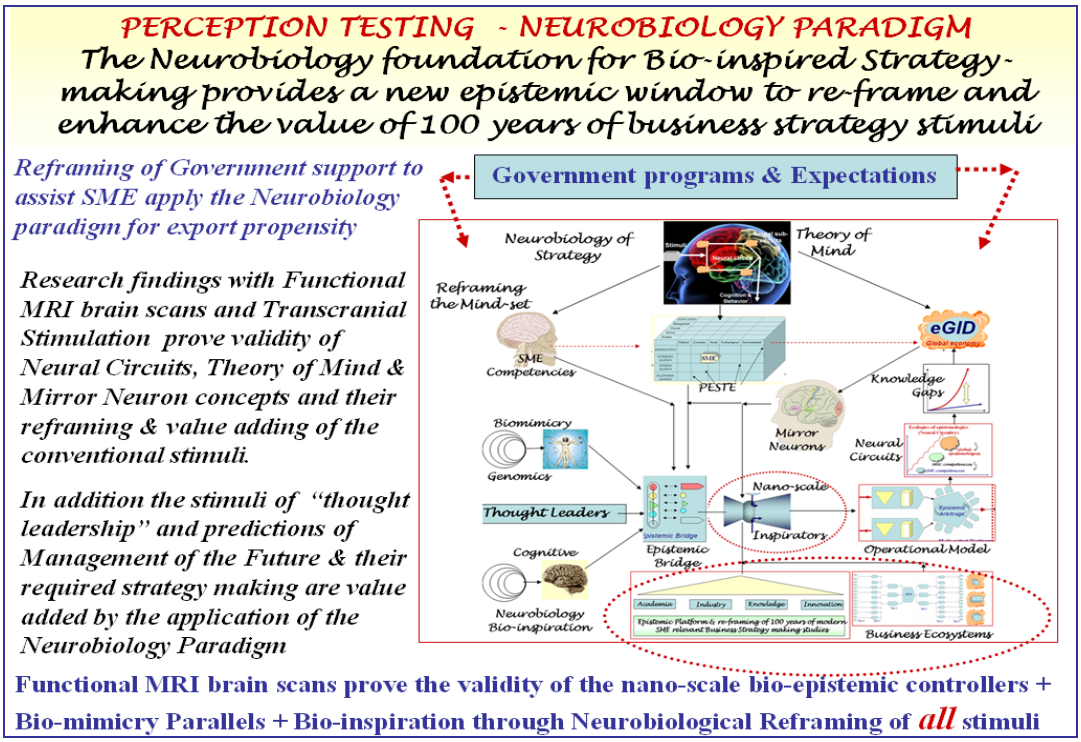


Figure 14.4 – Perception Test Validation – the landscape of stimuli

Perception is conscious response to stimuli. While every stimuli will generate cascades of neurobiological activities, the Perception Test seek to determine if the Model will deliver an appropriate response to the stimuli illustrated in Figure 11.4.

14.5 Bio-inspired Renaissance with the Neurobiology of the future

The stimuli can result from the macro-economic PESTE forces; from the Minds of ecosystem member; from eGID activities and from the Minds of experts, per the landscape of stimuli as illustrated.

14.5.1 Scientific basis of Behavior chain linkages to stimuli and future demands

Bahavioral Neuro-Biology for Business Strategy-making: Behavioral Neuro-Biology for strategy making delivers the neural basi of strategy making. Almost on a daily basis, the scientific press reports on the bio-chemical reaction that transform stimuli into behavior. The neural basis of strategy-making is the ultimate grounding of cognition. It is the seat or platform on which the cognition processes depend – for all cognition and behavior, including the behavior of strategy making.

Neorogenomics is increasingly relying on the knowledge of the 98% DNA and its Functional Elements including microRNA and RNA genomics as the eventual controllers of the neural interactions. At the molecular and cellular levels, these functional Functional Elements respond to external stimuli from the senses of ight, sound and effect.

Functional MRI traces and understandings of Cerebral Blood Flow (CBF) have confirmed that the resultin nano-scale epistemic controller reactions activate cascades of neural circuit as illustrated in Figures 14.1, 14.5, 14.6 and 14.7. These bio – chemical reaction, as recorded by fMRI brain imaging, confirm the Model's validity to appropriately respond to the focus on the epistemic catalyst are maintained.

fMRI resolutions of Cerebral Blood Flow representations are increasing, and there is scope for blood flow in the cerebral neural network's capillaries and veins may in the future provide the direct linkage to show illustrate the dynamics of the epistemic functions and controller interactions for cognitive behavior and eventual strategy making.

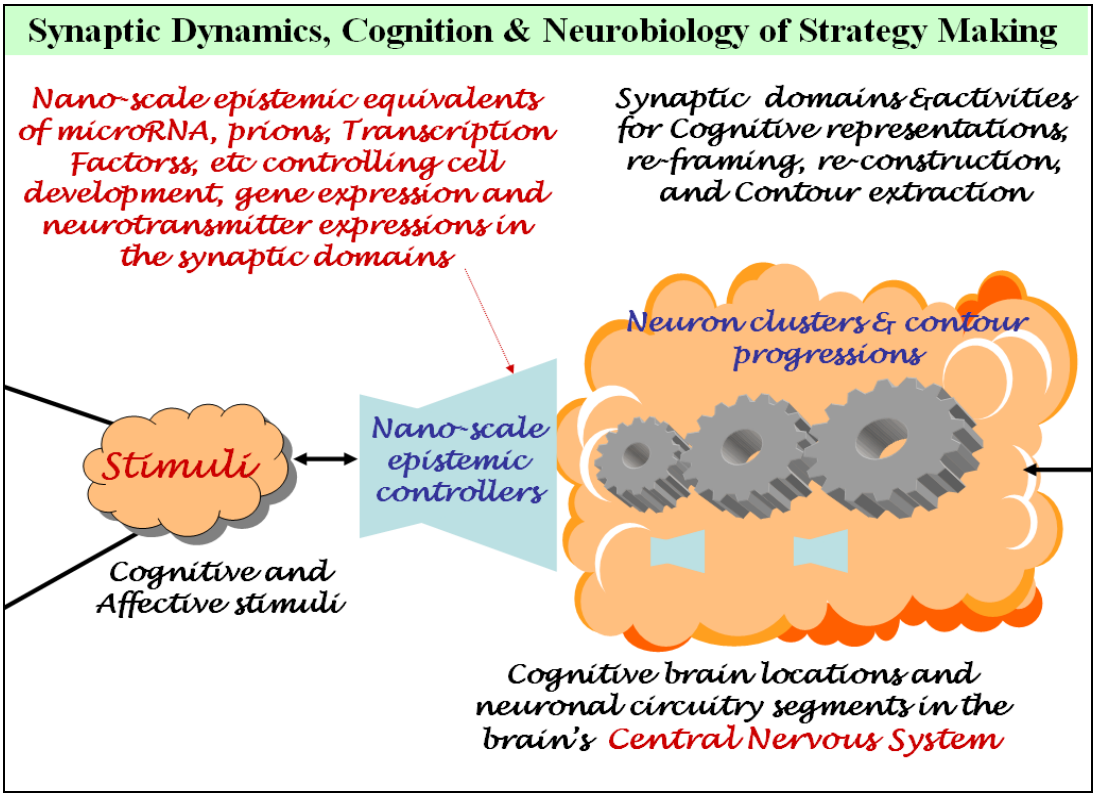


Figure 14.5 – Perception Test Validation – Neurobiological Cascading

14.5.2 Future demands are bio-epistemic clusters in the neuronal landscape

From a neurobiological perspective therefore all stimuli to the Model will generate appropriate responses. When the stimuli are considered in the context of past experience stored in memory and learning together with the Model's epistemic catalysts, the result are cascades of neural circuits.

The dynamics of the Ascent Routine of the Bloom Taxonomy can be thereby achieved, as illustrated in Figure 14.6.

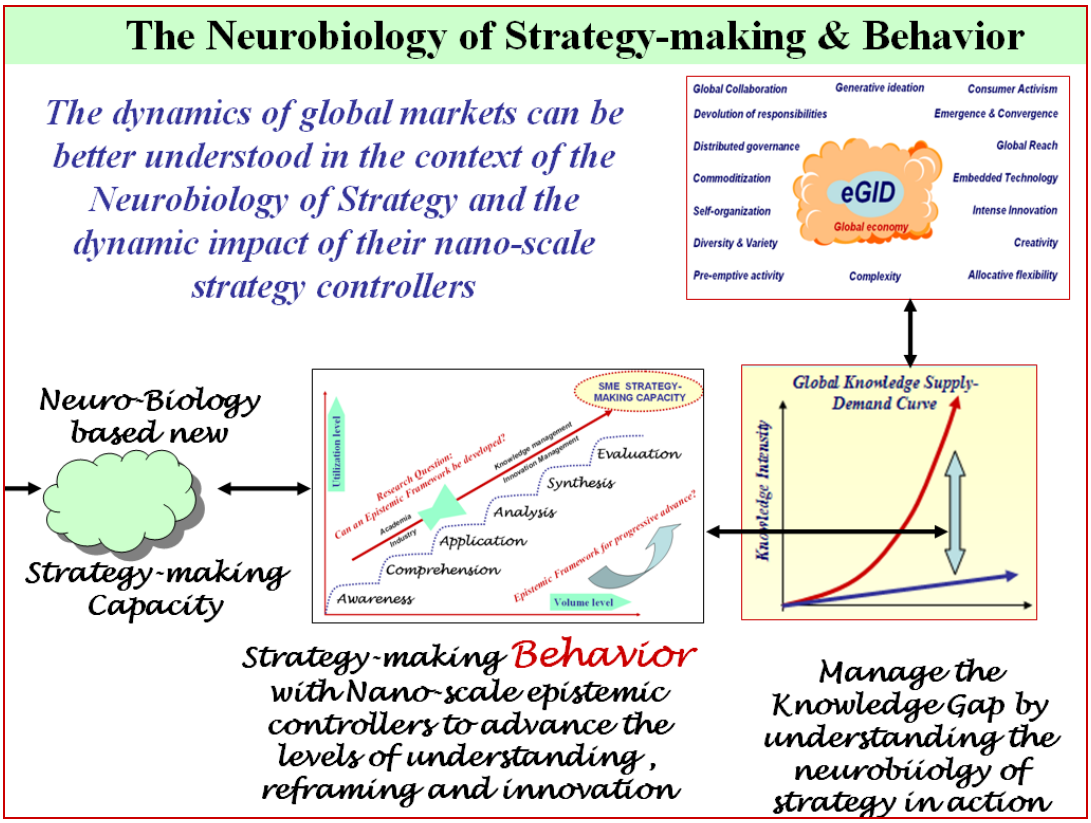


Figure 14.6 – Perception Test Validation

14.5.3 The neurobiology of the future

Scientific and experimental neurobiology confirm that the "Perception – Stimuli" generated cascades and dynamics are grounded in the managed convergence of epistemologies. Neural circuits representing Memories and Learning can be deployed for the Pre-2000 and the Post-2000 Business strategy – making building blocks.

Figure 14.6 and 14.7 illustrate the dynamics of the managed convergence of epistemologies resulting from the bio-epistemic signatures of stimuli, memory, learning, cognition, etc together with the embedded catalysts.

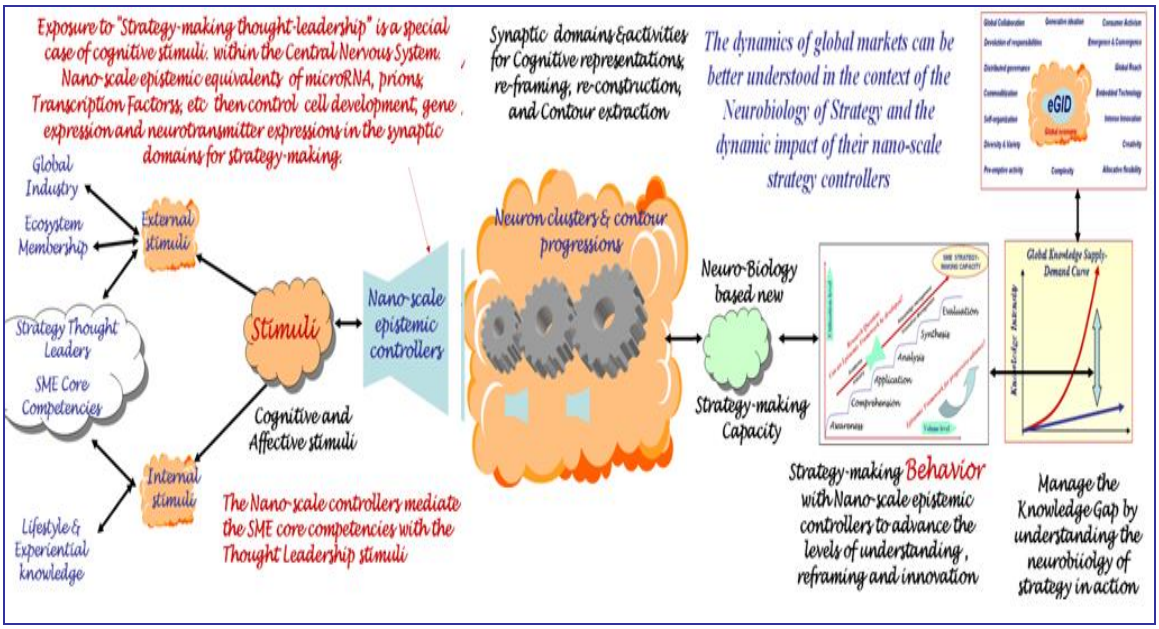


Figure 14.7 – Managed Convergence of Epistemologies for Perception Test Validation

The managed convergence of epistemologies (represented by the collection, cascading and dynamics of (concept – neural domains) or neural circuits) is able to accept and integrate stimuli and the Model's catalysts. It is on the basis of their common use of nano-scale spatio-temporal signatures within the geometries of the neuro-protein.

While the stimuli and catalyts utilize the common language of spatio – temporal connectivity, each possesses their unique signatures. The net result of their combinations is that SMEs will be empowered to better manage the knowledge gap curve illustrated in Figure 14.6 and 14.7.

14.6 Perception Testing in the context of the Renaissance

While the earlier sections have focused on the ground proof based on the Neurobiology of perception, a further regime of testing is considered necessary. It is based on representative Challenges to SME Strategy-making from the leading scholars and academic who specialize in predicting the business landscape of the future.

From a cognitive and epistemic viewpoint, the key issue for Perception Testing is the development of appropriate stimuli to the additional challenge. The Model's response to their stimuli needs to correlate to and be relevant to the context of SME strategy-making. In earlier Chapters, we have presented conventional business models and challenges that characterize the 100 years of Pre-2000 strategy – making. The historic context does offer lessons, and the Bio-inspirational Model and its nano-scale controllers must be tested with the stimuli-challenges (that best represent the future).

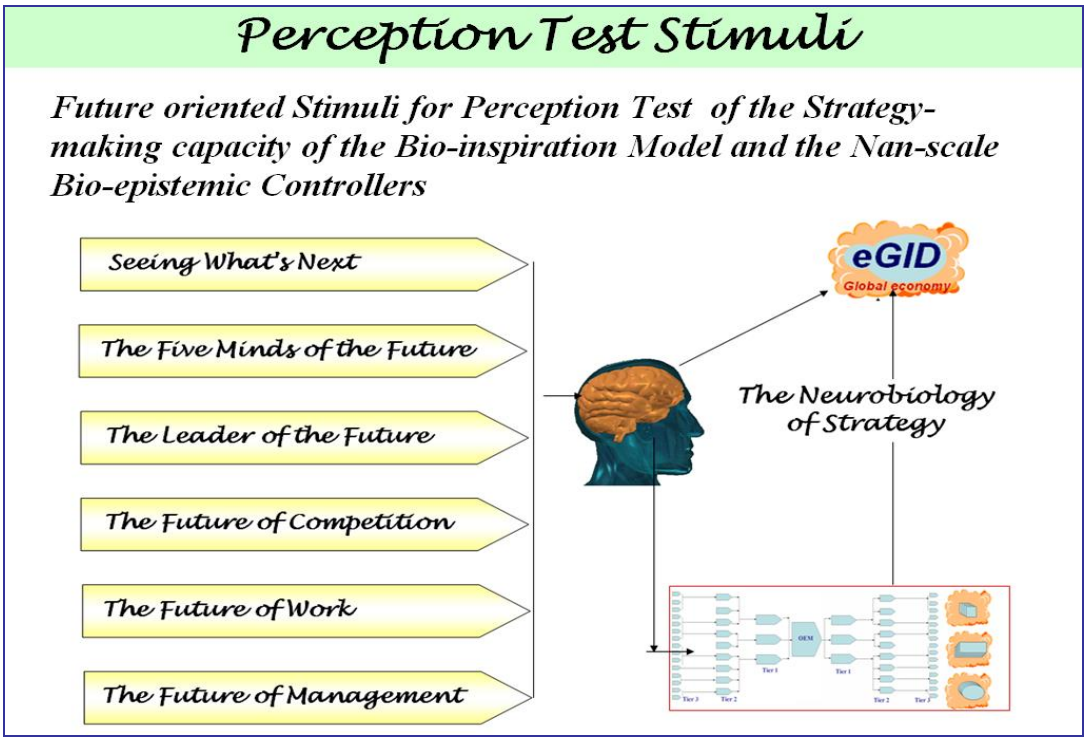


Figure 14.8 – Perception Testing the Model's capacity to manage the future

Figure 14.8 illustrates the Perception methodology where the stimuli-challenges from six strategy – making experts are used as the stimuli, that is being to test – impact the Mind of the strategist using Bio – inspired Model.

It is in this context that the following stimuli-challenges have been chosen as the "Test-criteria" to determine the validity of the Perception Test required on the Model and its Controller mechanism. The representative stimuli to the Model-controller are being extracted from the following:

(i) ***Seeing What's Next:*** Using the theories of innovation to predict industry change – the book by Professor Christensen of Harvard University, that outlines the demands on businesses working in dynamic business landscapes relevant to the Research Project

(ii) ***The Five Minds of the Future:*** –the book by Professor Howard Gardner of Harvard university. He is a world renown educational psychologist and scholar, who has been responsible for introducing the world to the concepts of multiple intelligence

(iii) ***The Leader of the Future – Visions, strategies, and practices for the new era:*** This is a publication by the "Leader to Leader" Institute, established in 1990 under the original title of the Peter F Drucker Foundation. Professor Drucker, until his recent passing was responsible for introducing innovative concepts on management strategies, and is generally credited with first proposing the concept of knowledge workers and the onset to knowledge-rich characteristics of the Post-2000 business landscape.

(iv) ***The Future of Competition: Co-creating unique value with customers*** – by Professors Prahalad and Ramaswamy of the University of Michigan Business School. Until his sad passing in April 2010, Professor CK Prahalad was acknowledged as one

of the world's greatest scholars in business strategy. With Professor Hamel, they together pioneered the concepts of Core Competencies and Strategic Intent – still valid nearly 30 years after they shook up the academic and business world with their innovative predictions and insights of the changes that were taking place in the global business landscape in the late 1980s.

(v) ***The Future of Work:*** How the new order of business will shape your organization, your management style, and your life – By Professor Thomas Malone at the MIT Sloan School of Management. Professor Malone provides unique insights into the strategy-making challenges confronting the Post-2000 business landscale, and thse insights are used to challenge the Research Project's validity as a Perception Test stimuli, and finally

(vi) ***The Future of Management:*** by Professor Gary Hamel, acknowledged as the world best strategy-thought leader, who argues the need for a new paradigm that transcends the 100 years of Pre-2000 thinking, as the core need for business and societal advancement in the Post-2000 era.

The portfolio of the Model's nano-scale controllers and catalysts are being tested to determine if they can specifically assist in the uptake of the stimuli provided by the thought leaders of the future of business. In the tables that follow, we identify the key determinants of a successful future for any business ecosystem. In each case we provide a brief note on how the Model and its strategy-making process can link and leverage the thought leadership to function as one further stimulus for the benefit of strategy-making.

14.6.1 The Future of Work 2.0 – Test Stimuli #1

In this section, we present Professor Tom Malone's key issues that are expected to impact on the strategy-making demands of the future. We also present the manner in which they can be satisfied by the components of the Bio-inspirational Model and the Nano-scale Controllers.

Malone's "The Future of Work" – Strategic Elements required in the future	***The manner by which the Bio-inspirational Model and the nano-scale Catalysts and Controllers are positioned to satisfy the demands and challenges of the future of Work***
Need to create and structure the Intelligent organization	The Bio-inspired Model offers SMEs a framework that is designed for development of an intelligent organization that is grounded on the same principles that Nature utilizes in the management of its 100 Trillion Cells and the 100 Trillion Brain network connections. All of them operate in collaborative fashion during conditions of health and illnesses occur when the 98% controlling DNA do not operate correctly. The intelligence (similar to their deployment by Nature) derives from the thematic group of nano-scale controllers which act upon the 1.8% genetic building blocks. These exemplars are being mimicked in the

	Model and SMEs can be assured of the validity of its lessons based on the scientific successes of Post-2000 molecular and cellular biology.
Continued need for Dialogue in a decentralized business ecosystem	The Model offers SMEs a portfolio of neuro-based Mind-Brain behavior controlling correlates as the scaffold for successful dialog in the developmental and transactional stages. The epistemic scaffold allows Pre-2000 business models and building blocks to be enriched and enhanced with the themes and focused outcomes and conditions of state that can deliver success for close-knit or dispersed ecosystem membership
Dialogue with freedom to decide	The Charter of epistemic catalysts offers SMEs a portfolio of guidelines and conditions of state that provide SMEs with clear options for choice and further development
Knowledge sharing requirement	The Model's epistemic scaffold provides SMEs with the same level of support that Nature provides for the creation of organs, tissues, limbs, and other systems – all sharing the knowledge and Wisdom resident in the common DNA molecule which is contained in each of their cells.
Enhanced levels of understanding among stakeholders	The functioning of the 98% DNA segments provide lessons for SMEs on how to improve, enhance, and adapt their individual and integrated knowledge-base with the common units of exchange and dialogue.
Scope for intervention into the value creation processes	The Model offers SMEs the opportunity to selectively embed the thematic catalytic value-adding conditions of state to the Pre-2000 business models to obtain the required renaissance in value, function, sustainability and relevance in the Post-2000 global market. The success of the Model is dependent upon the degree and the richness of the embedding of the catalysts over the entire strategy-making life cycle
Creating not just a richer but better world	Key epistemic elements within the Catalyst portfolio directly address the need for Integrity, Reliability, and Validity, etc – in the developmental and transactional life of all business strategies and activities. Hence the outcome of a better world can be assured.
Harnessing the power of crowds	The epistemic scaffold provided by the Model is akin to the mechanism that Nature uses to create new systems in the human life-form. The correlates of the epistemic infrastructure is first created and stem cells seeded within the newly created environments develop the required bio-epistemic ecologies. In a similar way, the Model can be structured to benefit from expansive global inputs for innovation development and customer fulfillment.
Accessing and managing	The epistemic catalysts function on the principle of

the convergence of economic factors	active convergence management of epistemologies. The Model directly applies this principle for the unification of communication systems, technologies and economic factors. No other living system on the earth manages convergence with the elegance of Nature embodied in the human life-from. The Future of Work in the Post-2000 era will be assured of this criteria being satisfied if the Model is implemented to design.
Accessing the convergence of technologies and membership capabilities:	The thematic portfolio of catalysts have been selected on the basis of their successful management of the convergence factors that delivered by downstream actions of the DNA molecule. The Model leverages their lessons to harvest the opportunities of convergence in technologies, business entities, strategic objectives, etc among ecosystem membership for collaborative gain
Requirements to upgrade the quality of communication	The Model's portfolio of theme-framing guidelines are specifically presented to enhance the level of communication within ecosystems, and in reading and interpreting the signals and patterns of the business landscape
Delivering to the world requiring hyper specializations	The Model is designed for the managed convergence of epistemologies and related expert knowledge by providing the scaffolds and the interfaces for connectivity. Nature utilizes this mechanism, whereby chains of molecular elements contain specialized molecules in branch chains that do not interrupt the linkages. Cohabitation of expert ecologies is possible because of the common epistemic infrastructure.
Addressing logistics gaps, knowledge gaps, infrastructure deficiencies	The Model offers SMEs a scaffold to fill operational, developmental, and transactional gaps in resources, functional elements, and fulfillment systems – with the assurance that they can work together based on their commitment to the units of convergence that unify their activities as a whole.
Managing loose hierarchies	As noted above, the Model is designed to benefit from "mass customization" where individual ecologies deliver their functional specializations while working from a common delivery platform, that is powered and controlled by the correlates of the 98% DNA segment.
Predicting the future	The epistemic catalysts enable business strategies to achieve and deliver thematic functional outcomes. This focus on functional themes will enable SMEs to interpret signals and identify patterns on matters of value or concern to customer relationship development in SME strategy-making
Risk sharing and democracy in ecosystem membership and	As above, with a greater level of assurance and support on the threats and risks confronting planned strategies and their implementation. PESTE forces for example

governance	once evaluated as the outcome of
Collaborative management between people and technologies	The determining value of the Model is its capacity and design to achieve convergence in all systems – human, technological, economic etc
Being able to leverage the new freedoms without micro-management	The Renaissance in strategy-making for the Post-2000 era is grounded in the neurobiology of self-management with unification and connectivity established by the 98%DNA and its correlates in the Epistemic catalysts. Once perception signals are encoded and delivered to the neuronal landscape, the neuroplasticity takes over under the control of the Mind with its self-organizing capacity. Strategies for successful work in the future will mimic this methodology and SMEs can take advantage of this perspective provided by the Model.
Transparency in decision making in internal and external markets	The epistemic exemplar and its portfolio of catalysts are correlates of Nature's mechanisms of the Mind. These are grounded in visibility and transparency for connectivity and convergence among the 100 Trillion cells that make up the human life-form. In a similar manner the Model's mechanisms will be able to address the unique features of the Future of Work and its strategy-making demands.
Decentralization in location, yet centralized and unified in approach and implementation	The Renaissance in strategy making is underpinned by the adaptation and re-configuration of Pre-2000 building blocks. These include the business models for multiple organizational arrangements. The architecture of the brain also imposes its demands for clusters and chains and platforms, and transfer stations, etc. The Model's lessons would therefore cope with the future demands for Post-2000 organizational development, in whatever configuration that may be required.

14.6.2 The Leader of the Future – Test Stimuli #2

In this section, we present Professor Peter Drucker's predictions on the key issues that are expected to impact on the strategy-making demands of the future. We also present the manner in which they can be satisfied by the components of the Bio-inspirational Model, its epistemic engine, catalysts, and the Nano-scale Controllers.

Drucker's "The Leader of the Future" – Strategic Elements required in the future	***The manner by which the Bio-inspirational Model and the nano-scale Catalysts and Controllers are positioned to satisfy the demands and challenges of the future of Leadeership***
Vision to manage the future	***and the challenges confronting the individuals and***

groups:	
(i) Develop leadership strategies in their own right	The Model provides leaders with a portfolio of higher-order thinking protocols and abstractions that can be embedded within Pre-2000 building blocks and business models for Post-2000 relevance
(ii) Develop a spirit of performance	The Model's portfolio of epistemic catalysts provide a usable framework for the deployment and management of performance criteria on issues of direct connectivity with Customer Value Propositions
(iii) Define the business	The Model overcomes one of the most difficult tasks of defining business models and enterprise vision. By highlighting the key value adding mechanisms and determinants, the business model characterization and definitions of vision can be achieved with relative ease and confidence in the integrity of the embedded message
(iv) Seek opportunities through creative destruction	The Model delivers renaissance for Pre-2000 building blocks and business models by selecting out obsolescence and embedding convergence management catalysts that relate to Post-2000 global customer value
Leading in a diverse world with unlimited variables and with the unprecedented velocity of change facilitated by technology:	
(i) Utilize a systems approach with strategy-making	The Bio-epistemic Model is grounded in Systems Biology so that it can deliver the lessons from Nature's Management of knowledge and Wisdom
(ii)Aim to secure resources from all stakeholders	The Model's focus on Convergence management is directly linked to mobilizing knowledge and wisdom from multiple sources, that can be aggregated to deliver the power of an intelligent business ecosystem
(iii)Draw upon the universal human values of insight and wisdom	The Model's lessons are directly generated from Nature's management of Wisdom, in coordinating the activities of over 100 Trillion cells that make upi the human life-form and the more than 100 Trillion synaptic connections that are utilized by the Mind in behavior management and control
(iv)Develop diversity management as a craft, with a professional grounding	The Model's underpinning with Convergence Management is based on Nature's management of over 200,000 proteins, and over 100 billion neuron cells that make up the Central Nervous System.
(v) Capture the benefits of multiple perspectives and insights	A key outcome of the epistemic Renaissance of Pre-2000 building blocks made possible by the Model is the generation of multiple perspectives from the embedding of chains, cycles, platforms, and bridges that are characterized by the epistemic themes. These offer new fertile ground for the Leader of the Future for opportunity capture

(vi) Understand diversity as a phenomena requiring a strategic approach	The Renaissance of the Building blocks with the embedded themes of the catalysts is expected to capitalize upon seeming diversity and instead harvest their unique compet4ncies and capabilities – with the benefit of the convergence interfaces provided by the Model
Leading in a Time of Crisis and Complexity with clear signals for navigating the barriers and the challenges:	
(i) Learn to anchor strategy making in adaptivety	Lessons from the scientific grounding of the Neuroplasticity discipline will motivate the SME to deploy and benefit from the dynamics of adaptation, transformation, and aggregation using the Model's epistemic catalysts. The new approaches are part of the new paradigm that Drucker has argued is a mandatory requirement from the Leaders of the Future.
(ii) Providing unique insights and perspectives for the Mission of the enterprise	The Model offers a diagnostic tool to better understand the drivers contributing to the complexities of the macro-economic PESTE forces and the phenomena of the target eGID landscape. The diagnostic tool is equally well suited to obtain insights on the required motivators for SME-ecosystem membership interactions and customer relationship development.
(iii)Learning to mobilize social resources	The new neurobiological perspectives on mobilizing collaborative action with the mechanism of convergence offers the SME as a Leader of the Future to create and avail of strategies that involve the convergence of technologies, social activism, and customer value proposition delivery. In particular the Model helps SME to crate epistemic scaffolds that can be designed to scale-up and expand in scope in their deliverables. The new strategic outcomes would be made possible by reframing the Pre-2000 business models in their Renaissance manifestation.
(iv)Willingness to accept responsibility	SMEs can afford to invest in the creation and development of business ecosystems linked tot heir strategic objectives on the basis of the lessons and guidance available from the Model's epistemic scaffold and their neurobiological resources. The enrichment of Cognitive Psychology with epistemically catalyzed inductive and deductive thinking will deliver firmer control over the proper assessments of a-priori and posteriori knowledge and their implications for risk and responsibility.
(v) Asking the right questions	As above
Transparency and leveraging of resources from ecosystem membership:	

(i) Core Competencies	SMEs can develop sustainable and enduring ecosystems based on the lessons on the management of convergent epistemologies. The epistemic exemplars allows SMEs to virtually clear the decks of unnecessary chatter and thereby enable a focus on the issues of strategic importance.
(ii)Co-creations with customers and ecosystem membership	As above
(iii)Leadership can be learned	The Model offers a relative simple set of protocols and guidelines for the delivery of the new leadership requirements postulated by Drucker.
(iv)Converting Wisdom into action	The Model is grounded on the use of the power of the 98% DNA which controls the timing, shape and applicability of the Nature's building blocks. By applying its lessons as it is being used in the Mind-Brain-behavior phenomena, SMEs are able to access the lessons of Nature's Wisdom, for strategy-making. No other inspirational construct exists on earth that can offer this level of inspiration and direct applicability and relevance.
(v) Organizing for results	The epistemic scaffold and their catalystic exemplars facilitate strategy making efforts on tangible outcomes – "not just doing things right but also doing the right things".
Management of Convergence and the responsibilities of Executive Management with a focus on ethical results:	
(i) Creating new business models	SMEs would be able to create the new business models that according to Drucker are required for the Post-2000 era. The Model offers a direct pathway with the Renaissance of the 100 year strategy-making discipline. The old can be renewed by embedding their intrinsic value with the new Post-2000 catalytic value adding convergence mechanisms, based on Nature.
(ii) Managing Knowledge worker motivational factors	The Renaissance of the 100 years of strategy can benefit from the parallel fields of the management of Organizations and behavior. The availability of the epistemic exemplar, its scaffold and the catalysts provide the new framing for achieving a similar outcome of Renaissance in human relationships and human resource management.
(iii)Managing and recognizing personal attributes	The bio-epistemic metaphor of "Jumping genes" provides the best explanation of the Model's capacity to cater to variability and innovation in strategy-making that can satisfy personal attributes and defining characteristics of the Post-2000 business landscape.

(iv)Defining the core value propositions offered	The benefits to SMEs from the Renaissance of Strategy-making extends to the definition and integrated fulfillment of the core constructs of "Customer Value Proposition" fulfillment. The thematic catalysts provide analytic visibility for definition of the required thematic deliverables as recommended and offered by the Bio-inspirational Model.
Leading beyond borders, crossing disciplines for the delivery of Customer Value Propositions:	
(i) Crossing discipline boundaries that are traditionally considered outside of the business domain	The Model offers SMEs a unified and singular theory for strategy-making that crosses geographical, cultural, and technological boundaries. More specifically the Model is well capable of understanding the driving mechanisms that are responsible for the PEDTE dynamics and the phenomena of eGID.
(ii) Recognizing Social impacts and System Citizenship with equity	The dominant factor contributing to the power of social activism is the commonality of purpose and their grounding in the value systems of humanity. The Model's epistemic catalysts are directly connected with the active engagement and intervention of these principles, as use by Nature. In particular the Model offers insights into the Wisdom of human cognition and its functioning at the meta-level of cognition and behavior. With this pedigree, SMEs can directly utilize the Models' catalytic exemplars to plan and develop strategies that leverage both the power and the wisdom of the crowd.
(iii)Building in "enduring societies" for collaborative action	The lessons from Nature's management of the Mind for the delivery of knowledge and Wisdom far outweigh any exemplar or paradigm for Post-2000 strategy-making. Drucker's challenge for the Leaders of the Future to develop "enduring societies" is but a sub-set of the scope and scale of activities and strategic behavior that can be unleashed by the Mind. The Model provides a framework for SMEs to achieve collaborative strength that they lack in comparison with MNC corporations and their respective positions relative to the eGID opportunity landscape.
(iv) Diversity Management	Diversity management in the context of the argument by Drucker requires SMEs to overcome theoretical differences in opinion or approach by disparate entities that may be needed to form collaborative ecosystems. The Model's scaffolds and its epistemic catalysts clear away these difference and bring the parties together with the mechanisms that bind the Mind and not divide each other.

(v) Defining the Customer with clarity	The Model provides SMEs with unique insights on the role of the Mind in shaping PESTE forces, micro-industry forces and the minds of consumers and collaborators. Its grounding in neurobiology and the 98%DNA mechanisms of convergence management provide the framework and clarity to assist in characterizing the needs of customers. It is not surprising that this cognitive facility of the epistemic Mind and its portfolio of convergence management mechanisms has not been utilized to the full in the Pre-2000 era. The Model's grounding in molecular, cellular, and genomic epistemologies has effectively established the case for the Renaissance in strategy-making and a deeper understanding for customer fulfillment.

14.6.3 The Future of Competition – Test Stimuli 3

In this section, we present the projections of Professors Prahalad and Ramaswamy on the key issues that are expected to impact on the strategy-making demands of the future. We also present the manner in which they can be satisfied by the components of the Bio-inspirational Model and the portfolio of catalysts and nano-scale Controllers.

Professors Prahalad and Ramaswamy on "The Future of Competition" – Strategic Elements required in the future	***The manner by which the Bio-inspirational Model and the nano-scale Catalysts and Controllers are positioned to satisfy the demands and challenges of the future of Competition***
Dialogue with the full range of entities in the business ecosystem including customers and facilitators:	
Knowledge sharing requirement	New frames of reference have been created by the Renaissance of Pre-2000 strategy-making building blocks that are designed to facilitate equitable knowledge sharing
Enhanced levels of understanding among stakeholders	The Thematic functional impetus provided by the Catalysts delivers enhanced understanding and mutual respect for the respective contributions being made. Their interdependencies become apparent with the characterization of their respective contributions and their juxta-positioning within cycles, chains, platforms, and other generative and fulfillment manifestations
Scope for intervention into the value creation processes	The neurobiology delivered Renaissance of Pre-2000 building blocks and new frames to understand the Information Tsunami deliver SMEs a new cognitive platform and a cognitive approach to understand and

	manage the emergence of the value creation processes and to utilize them for the new competition
Creating value networks and thematic communities	The expansion and creation of Value Networks is directly facilitated by the Model's explicit solicitation of its portfolio of Thematic catalysts. SMEs are better positioned to create and operationalize Value Networks as a key mechanism for strategy making and innovation – without resorting to generic hype or exhortation to general principles far removed from the technical and business challenges
Creating strategic capital	SMEs can develop and build their competencies and the ecosystem's potential for success with customers by deploying the Renaissance manifestations of the Pre-2000 building blocks and new insights on the Information Tsunami. The expanded cometencies-base will be more readily usable in Post-2000 versions of Multi-sided markets, and in Mass Customization strategic development.
Access to the Mindsets of the full range of ecosystem membership and with common units of exchange and units of analysis:	
Establishing value creating infrastructure	The Neurobiology of Strategy-making delivers new resources for creating the required mentation, the new mental models, and the new Theories of Mind that can be customized and aligned for the development of Co-created Value-making infrastructure. The Renaissance specifically facilitates the harvesting of the riches of the domain of Cognitive Psychology for creating the collaborative infrastructure for the new modes of Post-2000 competition.
Common access to collaborators for meaningful dialogue	All collaborators and more specifically co-creating customers can gain new insights for communication, deliberations and collaboration based on increased visibility and understanding from the neurobiology of functional themes and their direct relationship to the Stimuli-Mind-Brain-Behavior cycle.
Quality of co-creating experience needs to be developed, not just in quantity	The new perspectives offered by the Model's grounding in neurobiology and its scientific metaphors deliver credibility in their lessons, which makes for quality in collaborative discussion and decision-making. The Model's portfolio of Catalysts removes the limitations and the voluminous nature of the Information Tsunami – thereby allowing a focus on quality in the chosen thematic functionalities embedded within the Renaisssance
Risk Assessment frameworks and conceptual approaches that would enable collaborative innovations to emerge:	

Breaking out from entrenched ways	The epistemic Renaissance delivers SMEs with customizable and usable knowledge and modules that can be interconnected to benefit from the unique perspectives belonging to customers, suppliers, etc. Once the thematic embedding takes place, the resulting strategies are set free from their Pre-2000 limitations. Lessons from Systems Biology can deliver a constant and almost unlimited portfolio of lessons and examples for mimicking and bio-inspiration.
Moving away from Zones of Comfort	Participating customers and collaborators will be assisted in moving away form old entrenched biases of the Pre-2000 era. This would result from the direct linkage of the Bio-inspired lessons for acceptance of new epistemic and strategic positions. The renaissance in thinking will be achieved based on the scientific grounding and the personal biological and physiological experiences of all participants. The mobilization and use of metaphors and lessons with thematic focus can deliver the required strategic alignment for maximized innovation and Post-2000 strategy-making relevance.
Transparency and visibility in the individual and collective contributions to provide on-going feed-back and scope for real-time corrective action:	
Evolving role of the customer	Collaborators can benefit from the new transparencies with the Renaissance systems – to assist in better understanding of issues, the basis for shared responsibilities, the mutual interdependencies, and the recognition of value from the respective contributions. Specifically with the customer, the new framework establishes the grounds for a mutually beneficial relationship. This key requirement in the new competencies required for Post-2000 competition can be nurtured and expanded upon by in-depth appreciation of the Model's potential. The appeal from the bio-inspired nature of the new strategic approaches, as the ultimate source of knowledge and Wisdom, will encourage customers to reflect upon invitations to collaborate and thereafter cooperate.
Co-creating value with customers	SME strategy-making that seeks to implement the "co-creation" principle would be difficult without a change in customer mind-sets or alignment. The neuro-bio-epistemic underpinning of the new co-creating strategies offers a better chance for customer engagement and on-going participation.
Managing the emerging new Value Paradigm	The strength and impetus provided by the neurobiological foundation of the new strategies also offers opportunities for the required development of

Customer engagement will depend on safety and assured relevance on the value of their requested participation	new value creating paradigms that incorporate active customer collaboration. Thankfully the new paradigm's scientific grounding steers away from marketing hype and lexical fads. The messages will be accepted by customers in the new light that is generated from the enduring revelations expected on the main-stream nature of the science of neurobiology and the on-going and confirming lessons also expected form Post-2000 Systems Biology. The bio-epistemic portfolio of Catalysts can provide customers with the very reasons they are seeking before deciding to participate. The epistemic exemplar and the catalysts directly offer cognitive and emotional connectivity for the required motivation and decision-making.

14.6.4 The Five Minds of the Future – Test Stimuli 4

The research by Professor Gardner has developed the 5 "minds" which will be required for success in the Post-2000 ear of business. As an educational psychologist and scholar, Professor Gardner argues that these minds will make the difference of success and failure in learning and generating collective action. The "five" minds are particularly important in the context of the business ecosystems within which SMEs need to develop and implement their strategic successes.

Professor Gardner's " The Five Minds of the Future" – Strategic Elements required in the future	***The manner by which the Bio-inspirational Model and the nano-scale Catalysts and Controllers are positioned to satisfy the demands and challenges of the future Strategic Mindsets***
1st Mind - Ethical Mind to not only do things right but also to do the right things:	
Society's demands need to be considered in addition to corporate objectives	Strategists can make use of the transparency nano-controller to ensure ethical considerations dominate over the total life cycle of the business models, over entire value chain and all transactions. The ecosystem requires that all members in the system be supported and protected for mutual benefit. When human cells fail in one area, the downstream impact is felt throughout the person. Strategy makers can develop the embedded visibility or the usability, or transferability within the design of the goods and services offered, so that conscious decisions can be made by end-user clients
Governance over the entire value chain, in all inputs and	Identity and visibility are the key nano-controllers to ensure that the embedded and committed customer

outcomes, beyond regulatory compliance and risk mediation	value propositions are actually delivered. The control of identify is being increasingly made cost feasible with technologies such as RFID and digital databases that can be accessed across the customer
Altruism & good work	The Catalysis Catalog appeals to the need to do the right things as well as doing them right
Professionalism	The Catalyst portfolio is the resource base of knowledge that is implemented by the highest levels of PESTE forces and governance institutionss
Long term thinking	The Catalysis Catalog provided by the Model provides a continuum structure with for staged focus and trend management with the capacity to separate the temporary and the long term validity factors
Role fulfillment	The Model's portfolio of epistemic catalysts are steeped in ethical themes of integrity and equity and hence provide a guidance pathway for ethical role fulfillment that delivers sustainability
2nd Mind - Creative Mind that conceptualizes issues from abstractions to their concrete manifestations as a result of collaborative unions:	
Learning requirements	The Model provides a usable prescription on the issues that are determinants for achieving higher-order learning and cognition
Reflection requirements	A key outcome and facilitation mechanism within the Model is its capacity to provide a Reflection and Analysis framework for SMEs to make determinations on the scope to fully utilize their mind and the core competencies in an ecosystem framework
Combinatorial requirements	As above – Providing the framework and the resources to enable the ecosystem to hang together rather than from hanging themselves separately.
3rd Mind – Respectful Mind of the resource contributions made within groups and collaborative efforts to ensure maximum feeling of goodness and economic fulfillment:	
Interconnected world of Post-2000	The Model uncovers the abstract constructs that can catalyze and mobilize the power of convergence that is importantly required for Post-2000 strategy-making – the convergence of technologies, human thought, opportunity engagement, and economic factors of production and customer value fulfillment
Active engagement of the Human Mind and its respect for human values and the rights of individuals and their	The Model leverages the understandings utilized by Nature in both the cognition spectrum and the humanity spectrum. This is the only joint framework that can deliver sustainability based on reasoned

dignity	thought and deliberations that can yield consensus and collaboration
Balancing the needs of our objectives in the ecosystem of competing demands	The Model provides the Charter and the final arbitrator for productive and ethical leveraging of the power of the Mind in Post-2000 SME strategy-making that will be self-sustaining
4th Mind Disciplined Mind to be able to focus beyond codified knowledge and integrate abstract underpinnings of the knowledge-base:	
Managing convergence in though and expert opinion	The Model strips away epistemic confusion by its focus on themes for convergence of the portfolio of epistemic conditions of state – these naturally remove the barriers that prevent recognition and the delivery of the necessary respect for the contributions that can be made by the individual experts within an ecosystem
Need to manage the different profiles and continuum of intelligence	The Model offers a "Theory of Mind" facility to enable users to adopt meta-level and higher order thinking that can fully appreciate the expert contributions of individuals and meld them into a fully functioning whole, which is "greater than the sum of the parts"
The challenges of Interconnections and convergence management	The Model's resource-base is grounded in Systems Biology which provides the ultimate exemplar that confirms the need to investigate, identify and leverage convergence by using the Epistemic Catalog of catalytic thinking
5th Mind - Synthesizing Mind with resources from multiple source and across disciplines for individual and collective benefit :	
Integrating thought from multiple sources	The Model is specifically designed to leverage the collective intellectual resources of the Minds of the ecosystem membership by providing the epistemic bridges for convergence in technology, thought, economic factors, and customer value fulfillment
Cultivating Mindsets to collaborate with equity and resolve potential barriers	The Models provides the required resources to visualize patterns and themes that can be linked to Customer Value Proposition delivery and relationship fulfillment
Selecting appropriate resources and knowledge assets from multiple sources	The Model helps SMEs to anticipate the need for the type of epistemic themes offered in the portfolio of Epistemic Catalysts for Convergence Management of disparate epistemologies. The Model specifically encourages portfolio management by the expert while actively creating the epistemic infrastructure for their aggregation.

Integrating action from multiple sources	The focus on the portfolio of epistemic catalysts not only delivers integration but also value adding and alignment with the needs and demands of the Post-2000 global customer-base for SME strategy-making.

14.6.5 The Future of Management – Test Stimuli 5

In this section, we present the key issues that impact on the strategy-making demands of the future. Professor Hamel has rightly explained that the new frontier for innovation must include the innovations in business models, in business collaboration, and in harvesting the knowledge of the entire team. Strategies for the future must address the strategic elements explained in his 2007 book – The future of management. Effectively the strategic elements outlined by Hamel 2007, are the "perception test stimuli" to which the bio-inspirational model must provide valid responses. In the following table we present the manner in which the test stimuli can be responded to, with the components of the Bio-inspirational Model and the Nano-scale Controllers actively embracing and supporting the stimuli to a significant extent.

Professor Hamel's "The Future of Management" – Strategic Elements required in the future	***The manner by which the Bio-inspirational Model and the nano-scale Catalysts and Controllers are positioned to satisfy the demands and challenges of the future of Management***
Analogies from atypical organizations that represent the realities of Post-2000 business landscape	
(i) Exploit power of analogy	The Model is based on the highest level of metaphoric leveraging possible – directly from the lessons that nature utilizes in every human life-form. This is the meta-analogy – with no limiting conditions imposed on the lessons being made available
(ii)Large organizations are collections of local communities	Multiple ecologies and lesson providers are made available from every system making up the human life-form. More specifically the ecologies of the Mind offer direct and usable lessons
(iii) Learn from unconventional organizations	The Model provides lessons from Post-2000 Systems Biology that have transformed their Pre-2000 status into one of proliferating successes
The Ultimate Advantage by convergence of technologies, economic infrastructure and communication systems:	

(i) Manage intangible assets	The Model directly assists with the management of abstract concepts that are usable as the epistemic catalysts to transform and adapt Pre-2000 knowledge for use with Post-2000 relevance
(ii) Capturing the wisdom of every employee & collective wisdom	The Epistemic catalysts and the epistemic engine of the Model are designed to deliver connectivity and convergence for the unification of knowledge and the application of Wisdom an its insights in the conjoined knowledge base so developed
(iii) Building a global consortium	The epistemic glue for connectivity is limitless in its strategic reach and applicability – to near and remote sources and ecosystem membership
(iv) Develop new to market innovations	The Model's exemplars and catalysts provide a ready-to-use checklist on thematic value propositions that can be commercialized. The focus on their abstracted understandings offer potential to accelerate their presentation and early market entry
(v) Develop organic growth strategies	Lessons from the Model's organic legacy are directly applicable for staged development and condition-based pathway variations
Create a new Agenda for Management Innovation in the Post-2000 era characterized by global innovations:	
(i) Be bold	The portfolio of exemplars and catalysts offer unprecedented opportunities to be innovative and strong in the development of new customer value propositions and value adding operations
(ii) Be nimble in change	The embedding of catalytic themes offers an elegant system for the transformation and enhancement of Pre-2000 building blocks
(iii) Make innovation everyone's job with options to opt-in	The availability of the catalog of catalysts lends itself for shared use by all ecosystem membership
(iv) Challenge existing business models	The focus of the Model is on retaining and upgrading and enhancing the intrinsic value of Pre-2000 building blocks with the currency of Post-2000 relevant catalytic themes
(v) Capture the best from everyone	As above
(vi) Focus on a sense of purpose not just exhortation	The Model's thematic portfolio of catalysts provides strategic direction and pathways for strategic intent rather than slogans and fad-

	style hype
Creating a Community of Purpose for unified and collaborative action recognizing strengths of the business ecosystem :	
(i) Deconstruct orthodoxies	The underpinning structure of the Model is the deconstruction and reflective upgrading of Pre-2000 building blocks with embedded thematic catalysts for Post-2000 relevance and innovation
(ii) Create trust	The published portfolio of catalysts and the framework for their embedding are based on open and transparent processes and pathways that can engender trust among the ecosystem members
(iii) Develop Integrity	As above
(iv) Encourage transparency	As above
Building an Innovation Democracy within ecosystems that encourage diversity within common purpose:	
(i) Encourage contrarian thinking	The Model refines Hamel's suggestion for innovative thinking – it accepts both contrarian and convergence thinking – to be achieved by refection on the thematic portfolio of epistemic catalysts
(ii) More leaders less bosses	The published availability of knowledge on the Model's catalysts facilitates equity and more expansive participation and contributions from all members
(iii) Prepare to re-distribute power	Again the visibility of the value of the thematic contributions provides an automatic agenda for benefit sharing on an equitable basis with the distributed sharing of assigned responsibilities
(iv) Encourage leadership and commitment	SMEs are well positioned to use the Charter of Thematic Exemplars and Catalysts for establishing and securing ecosystem leadership for global success
Aiming for an Evolutionary Advantage that offers potential for on-going renewal and relevance:	
(i) Reframe existing business model	The meta-strategy of the Model is the reframing of issues and business models and pathways along thematic lines to bring them into Post-2000 relevance
(ii) Use self-managed teams	SMEs have the opportunity to highlight the importance of the relative contributions for equitable benefit sharing for their respective contributions that result from and are based

	on self-managerial principles
(iii) Define business expansively	The selection and application of the Thematic elements from the Epistemic Catalog of Catalysts possess the power of almost unlimited potential for expansion – because it engages and unleashes the power of the Mind to strategy-making along the entire life-cycle of the innovation generating cycle
(iv) Experiment with new ideas	The Catalyst Catalog provides a ready reference for the framing of new ideas or the adaptation or re-framing of Pre-2000 building blocks
Escaping the Shackles of Pre-2000 thinking and legacies with limitations on innovation generation in business models and ecosystem structures:	
(i) Challenge precedents	As above
(ii) Uncover shared beliefs	On reflection, any effort to achieve shared beliefs will need the type of Reference Criteria that is provided by the Catalytic Catalog offered by the Model
(iii) Ask right questions	As above
(iv) Value persistence	The Model's tenant is to leverage interdependencies and achieve in the process the persistence and maintenance of thematic chains, cycles, platforms, etc required for value delivery that should be linked to customer relationship propositions.
Embracing New Principles of collaboration, common meaning, and high order thinking for customer value proposition deliver:	
(i) Search for new principles	The Model's catalog of epistemic conditions of thematic state are the source for such principles
(ii) Unravel the management genome	The Model is based on the direct lessons available from Nature's management of the human life-form and all of its activities, a subset of which includes strategy-making
(iii) Reconstruct the management genome	The embedding of the epistemic catalysts is a key directive of the Model's implementation pathways
Learning from the Fringe on the new Post-2000 demands of global markets with their access to global products and service providers without limits:	
(i) Use new vantage points	The Model offers learning from the supreme source of knowledge and wisdom, that is embedded within the Mind of the human life-

	form. Its lessons provide the supreme vantage point for lesson capture and implementation
(ii) Monitor positive deviants	As above
(iii) Find the fringe	The fringe in this case is the ultimate source of lesson capture from Nature's Knowledge and Wisdom Management systems
(iv) Amplify human imagination	The resources of the Mind have been designed specifically to unleash the possibilities and innovations of human thought in a structured and sustainable manner, with integrity and equity as one of its core catalytic themes
Forging Management 2.0 strategic approaches that reject limiting orthodoxies and	
(i) Advance from inspiration to capability	The Model's epistemic catalog and its epistemic engine are designed specifically to advance the deliverability factor
(ii) Have courage to lead	The implementation of the themes of the Catalysis Catalog reduces the risk level to issues that can be managed with relative ease by the specializations that would be brought together within an ecosystem
(iii) Focus on causes not symptoms	This becomes transparent with the guidance of the Catalog
(iv) Work from the future backward	As above – the end-conditions directly relate to the cycles, chains, platforms, etc delivering the Model's value proposition conditions of state. Working backwards will allow deconstruction for effective ecosystem responsibility distribution and collaborative delivery of the re-integrated offerings
Building the Future of Management with the new thoughts and expectations of the Post-2000 world as the new reference:	
(i) Build a growth engine like IBM	Nature's lessons are being made available for the coordinated and distributed efforts of organizations like IBM and beyond because they are grounded on the power of the Mind and its existence in the human life-form rather than any specific enterprise structure
(ii) Exploit collective wisdom	As above
(iii) Run new processes in parallel with the old	Again the Model provides a further advance in thinking of the Hamel directive, because it allows the substitution to take place with less risk when the catalytic embedding is carried out within the Model's structure and its

	implementation engine

14.6.6 Seeing What's Next – Test Stimuli 6

In this section, we present Professor Christensen's predictions on the key issues that are expected to impact on the strategy-making demands of the future. We also present the manner in which they can be satisfied by the components of the Bio-inspirational Model, its epistemic catalysts, and the Nano-scale Engine-Controllers.

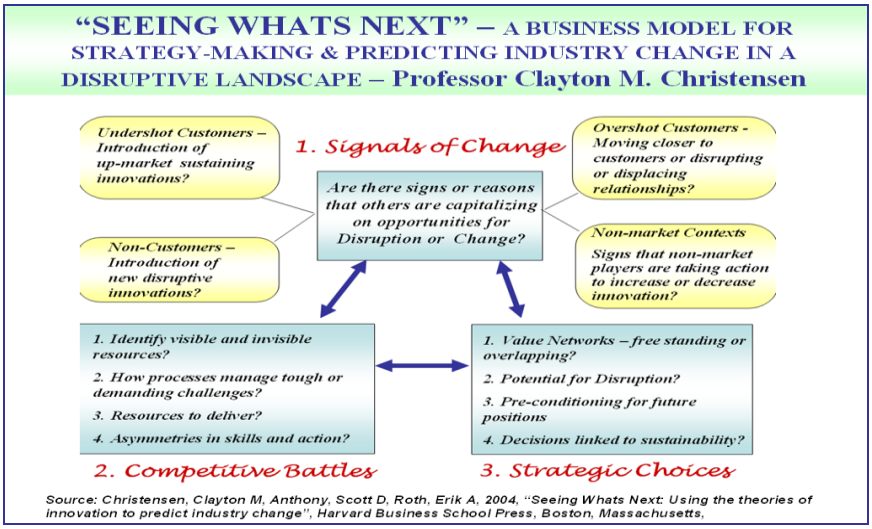


Figure 14. 9 – Perception Test Validation – Seeing the Future

Professor Christensen's "Seeing What's Next" – Strategic Elements required in the future	***The manner by which the Bio-inspirational Model and the nano-scale Controllers satisfy the demands and challenges of the future***
Signals of change which need to be monitored and managed:	
Overshot customer demands	The Model's epistemic scaffold provides a virtual checklist of value adding catalysts that are of relevance to customer value propositions and relationship development. Also the thematic nature and functionality of the epistemic catalysts provide a further indication of the trends that are related to customer demands in the Post-2000 era. The neurobiological basis for the PESTE forces – as the aggregations of epistemic-based thoughts and expectations of decision makers – also becomes transparent when the Model's focus on the themes of epistemic convergence are applied. Overshooting of customer demands due to poor perception are avoided using these integrative

	resources. In addition, the Model can assist SMEs evaluate potential markets on the degree to which there is overshoot that needs to be curtailed or modified.
Undershot customer demands	For the same reasons, SMEs are better able to see patterns, trends and fulfillment dynamics and avoid undershooting. Strategic opportunities that may exist for the SME also becomes apparent using these same resources made available by the Model.
Non-customer contexts	The Model's epistemic scaffold offers SMES the opportunity to identify gaps that can be addressed for commercial gain. While the epistemic scaffold is directly connected to customer delivery, the thematic chains and cycles developed as a result can assist in identifying non-customer contexts that may be the incubator of future opportunities.
Non-customer identities and entities that will need to be serviced	As above
Competitive battles that will need to be managed in the Post-2000 business landscape:	
Mobilizing visible and invisible resources for competition	The Model is underpinned by the collective and collaborative packaging of theme-enhanced building blocks and business models. The protocols to embed the Model's catalysts can directly identify factors that are relevant for ecosystem to ecosystem competition
Learning from how processes in third party entities are managing success	The Model not only helps achieve higher levels of understanding but this knowledge can similarly benefit with the creation of strategies and initiatives that would otherwise have remained hidden
Resources for successful Lesson delivery	The Renaissance in Strategy-making building blocks provides the unbounded and scientifically grounded resources that are required to visualize innovation and seeking into the strategic future. The new perspectives gained from the neurobiology of the constructs of Cognitive Psychology are also helpful in crating and delivering lessons for the Future. For example, the concept of Theory of Mind when applied to PESTE macro-economic forces provides insights into the minds of the PESTE decision-makers, the regulators, and the participants. The epistemic catalysts provide a further resource and framework to identify and visualize the underlying patterns and cycles and transformations taking place in production, delivery and fulfillment systems alike.
Asymmetries in skills and action	The combination of the new approaches from Cognitive Psychology and the Neurobiology of Stimuli

	and the Mind-brain-behavior chain are further tools to make sense of the dynamics of the eGID
Strategic Choices that will need to be mobilized for joining the competition in self-organized business ecosystems:	
Free-standing and Overlapping Value Networks	The Model is grounded on lessons obtained from Nature's management of over 100 trillion cells in varying ecologies and sub-systems. The lessons from the neurobiology of thought and decision making are of particular value for SMEs to create and mange strategies of free-standing entities that are linked by the convergence of epistemologies and the epistemic catalysts. The Renaissance for the reuse and value adding of Pre-2000 building blocks offers further resources for SMEs to allow business ecosystems to deliver thematic value propositions, with a dynamic competency that meets the evolving demands of customers and collaborators.
Monitoring the disruption potential of technology	The dynamics of technology and the expansion of its strategic-stretch can be best visualized from the lessons of neuroplasticity. Its emergence as a mainstream issue of discussion provides SMEs with ready-to-use lessons on the morphing and expansion of technology for the delivery of the Mind's epistemic catalysts. The epistemic intervention provided by the Mind's mechanisms and its application in Cognitive Psychology provide SMEs with a unique platform to see patterns from perspectives never possible in the Pre-2000 era.
Pre-positioning and pre-conditioning for creative destruction	The neurobiology and the mechanisms of the Mind also provide and unprecedented understanding on how SMEs can better manage the demands of the PESTE forces and the dynamics and phenomena of eGID. In the Pre-2000 era these conceptual constructs were generally accepted as remote and detached from the strategy-making tasks. They just had to be accepted as facts. The new Mind-brain-behavior paradigm confirms the common origin and base of all human activity. The knowledge of the Mind as offered by the Model facilitates a better understanding of the patterns and directions and key determining epistemic catalysts at play. SMEs making use of this common reference system would be better able to develop strategies that focus on the driving epistemologies and mindsets.
Actions anchored to sustainability	Several of the determining catalysts addresses the challenges and opportunities of sustainability, integrity and visibility of environmental impacts in resource mobilization. The natural framework again delivers a

	double function of protection and opportunity realization.

14.7 Overview of the Perceptual Evaluation

In the earlier Chapter 13, we subjected the Bio-mimicry based Model to "concept test" regime. From the test we reached the conclusion that the epistemic parallels between biology and business extended far beyond the similarities that exist between business operations and human biological activities. We cited research being conducted with Functional Magnetic Resonance Imaging (fMRI) that conclusively proved that strategic thinking was grounded in the neurobiology of cognitive and behavioral psychology. Brain scans with fMRI and other electronic probe systems were able to justify that all human thought under the mental state of conscious consideration was grounded in neurobiology, and that Post-2000 research findings in Systems Biology.

The combination of conceptual representations and Perception are grounded in Neurobiology and Cognitive Psychology. Research by Barsalon (2008) has confirmed that the Mind of the Strategist is dynamically involved with the managed convergence of stimuli, memory learning, knowledge, experiences, and emotional affect, as illustrated in Figure 14.10. Their common grounding in the bio-chemistry of nano-scale space – time connectivity fulfills the Perception – test criteria from all stimuli – viewpoints.

Additionally however the concept of the managed convergence of their respective epistemologies offers SMEs a new opportunity to re-use the Pre-2000 knowledge resources (originally intended for MNCs).

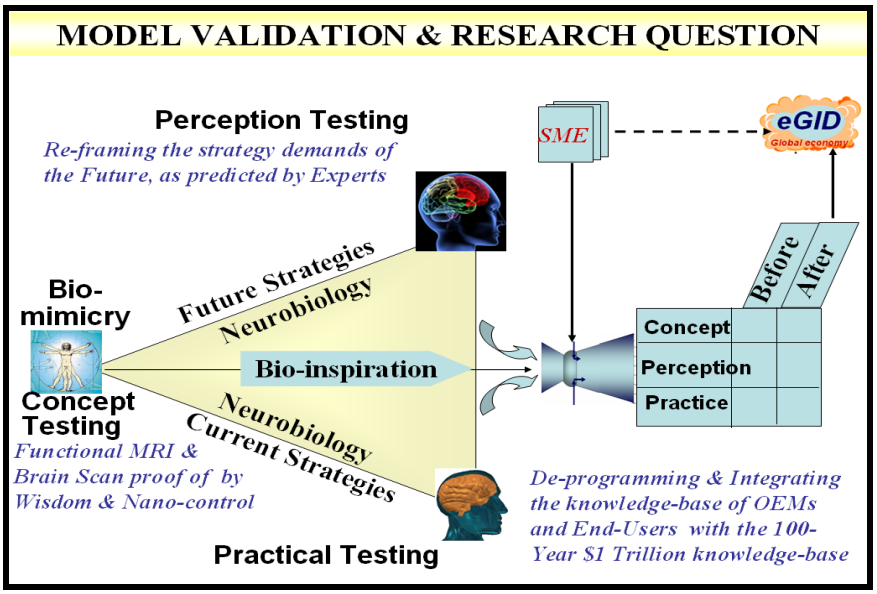


Figure 14.10 : Research Question validation

14.7.1 Strategy-making Renaissance from the Neurobiology of Strategy

The Perception Testing exercise has offered SME the understanding and the assurance that all Pre-2000 barriers and difficulties could be better managed by the common bio-epistemic unit of exchange that underpins all stimuli – Mind – Brain Behavior interactions.

This bio – chemical based common unit of exchange equally applies to all Pre-2000 and Post-2000 building blocks as well as to all the strategy – impacting activities, impacts, and criteria of the PESTE forces, the eGID phenomena, the activities of Learning and development, as well as the catalytic structures of the Bio – inspired Model.

Figure 14.11 illustrates the epistemic landscape of challenges that once appeared imponderable. However with their common scientifically – based legacy, these challenges can be visualized as the feedstock for combination/ embedding of different strategy – making business artifacts with stimuli and the Model's Epistemic Catalysts.

A Renaissance in strategy – making thinking and approach is thereby possible. Figures 14.11 and 14.12 for example present the continued ascent of generic Pre-2000 Business strategy – making artifacts into innovative Post-2000 strategies for SME consideration and potential success. In Figure 14.11, the three illustrated sub – domains all aim to connect the SME to the eGID landscape.

In the upper centre of the diagram the common bio – epistemic/ bio-chemical unit of exchange empowers SMEs to approach the Information Tsunami and the legacy based building blocks as nothing other than bio – chemical representations.

Their Renaissance emerges when the Model's Epistemic/ bio-chemical catalysts are combined and or embedded using the Model's Engine. Convergent and divergent thinking, deductive and inductive reasoning, and constructive and destructive reasoning – are all applied in the Model's Engine. The result is innovative outcomes from the Renaissance/ Re-combination from the Bio-inspired metaphoric exemplar in Systems Biology.

The same Renaissance occurs from the use of the common unit of exchange with new lessons from Systems Biology feedstock (lower left) domain and from the Fume Minds of strategic – thought leaders (lower right) domain.

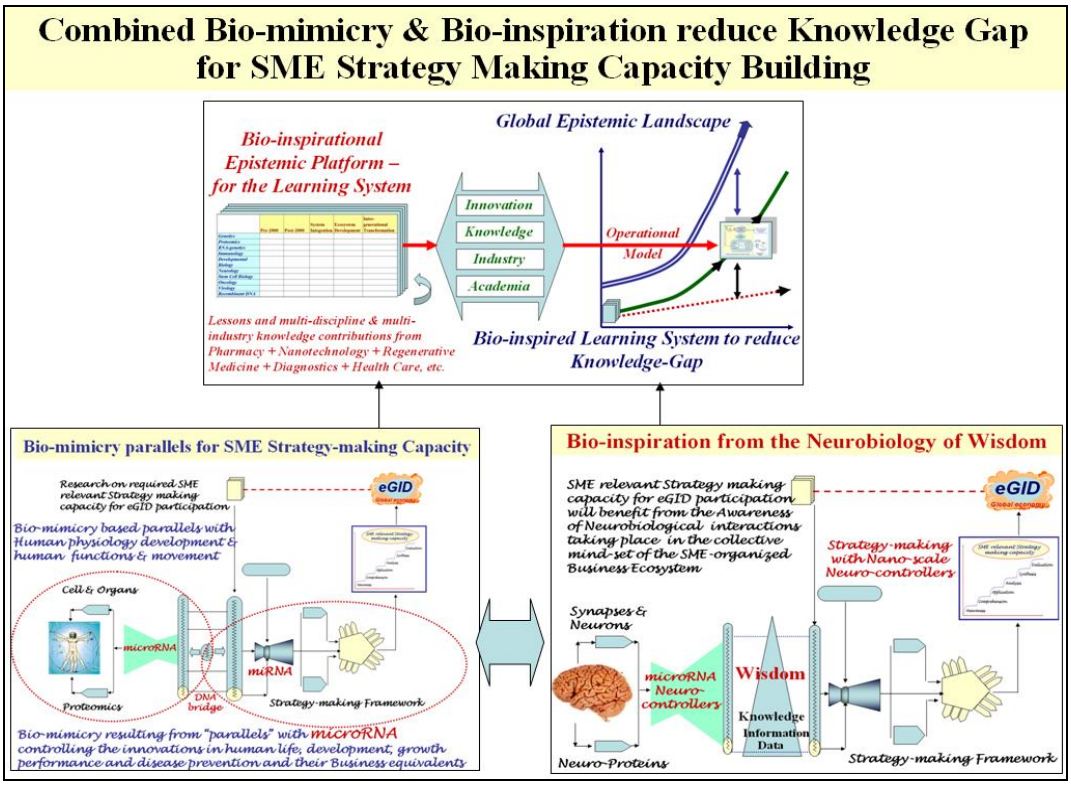


Figure 14.11 – Perception Test benefits for strategy – making Renaissance

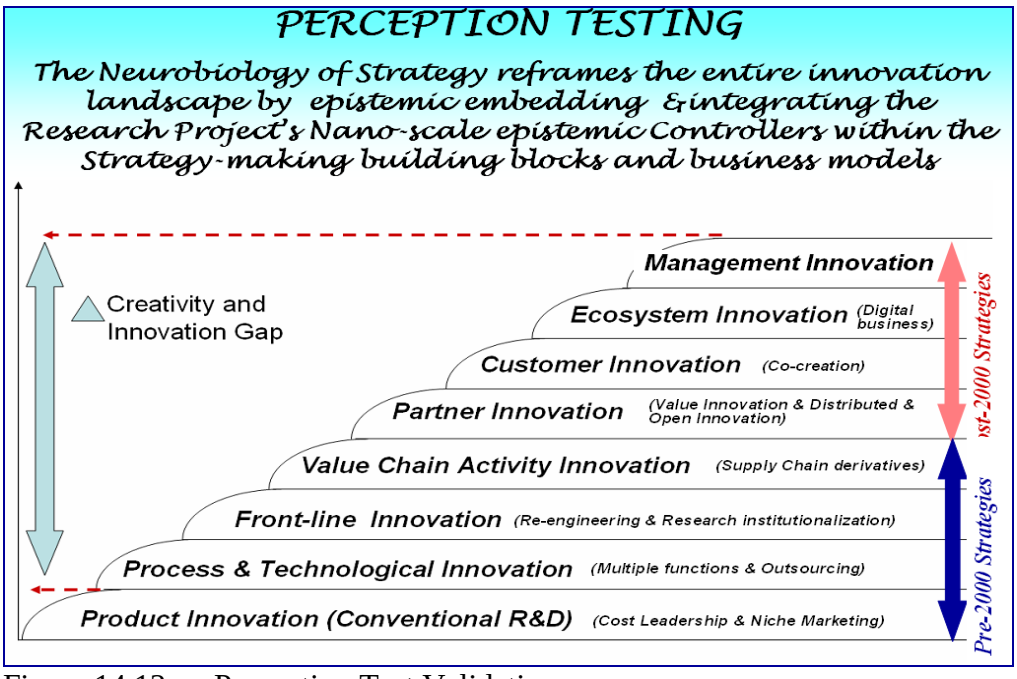


Figure 14.12 – Perception Test Validation

14.7.2 Reframing of the Innovation Landscape with the Neurobiology of Strategy

The positive result of the Perception Test extends beyond validation and acceptance of all stimuli as feedstock for strategy-making. More specifically the common bio-epistemic/ bio-catalytic/ bio-chemical nature and grounding of the Model's feedstock, its Epistemic Catalysts and its Epistemic Engine – all provide a new transformative platform for strategy – making.

All knowledge building blocks, all Bloom Learning Taxonomies, and Thoughts – Leadership stimuli can be transformed through the Model Catalytic embedding. The "Reframing" of all Pre-2000 and Post-2000 building blocks are the bed-rock for Schimpeter's innovation. Schimpeter's creative destruction mechanism, as practiced by Nature is the Epistemic Exemplar for the Renaissance strategy – making as illustrated in Figure 14.13.

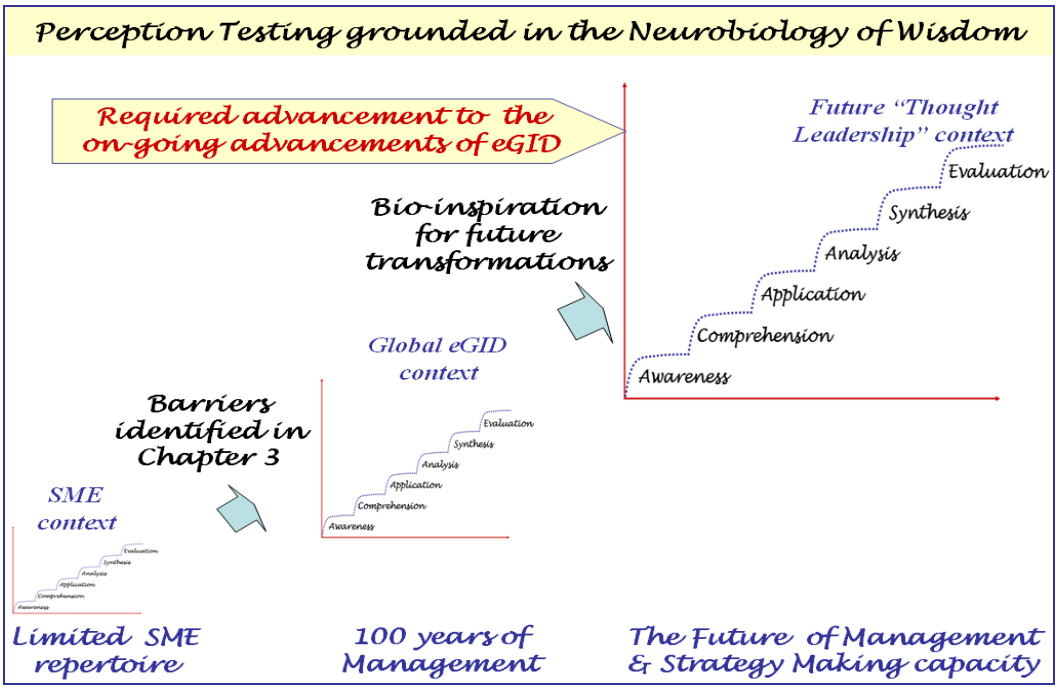


Figure 14. 13 – The transformed strategy – making landscape for Schimpeterian Innovation

The transformed knowledge assets are the Neural circuits of higher capacity that are progressively involved with strategic migration to the highest levels made possible by the introduction and embedding of the neuronal correlates nano-scale bio-epistemic controllers.

14.7.3 Transforming "Theory of Mind" and strategy-making behavior

Behavioral neurobiology has similarly been transformed by the bio-epistemic nano-controllers. The Model's catalysts are an active element in cognition development and behavior. The combination of "Behavioral neurobiology" with Theory of Mind behavioral psychology is effectively a reverse engineering process. Together they transform the epistemic dynamics and the resulting epistemic creations and transformations that manifest themselves as innovations.

Using the grounding in neurobiology of Wisdom and Knowledge, the Perception Tests have confirmed that the stimuli from though leaders in modern business strategy making is nothing other than a further wave of stimuli, albeit from world-best thinkers and predictors of the future of business trends and strategy requirements. The neurobiological grounding in combination with the PhD Models' portfolio of nano-scale epistemic controllers have further proved that the existence of the cognitive stimuli can be integrated within what used to be known as the psychological phenomena of "Theory of Mind".

The phenomena status of PESTE forces, eGID, thought- leadership, etc have all been transformed into the scientific world with the same neurobiological grounding. Theory of Mind phenomena was suggested as a meta–level, high order cognitive thinking approach, which provided a capacity to decode in advance the thinking and behavior of others. In its pre-scientific grounding, the concept of Theory of Mind was supposed to analyse and evaluate thinking and behavior at the deep psychology level, assigning intentionality and motivation, and cognitive thinking and models to observed or predicted behavior.

The transformation of Theory of Mind to the neurobiological domain has transformed the psychology of predictive behavior and the understanding of brain functioning in strategy – making in involving the eGID landscape, that was earlier so challenging to SMEs. Functional MRI studies have traced the neuro-dynamics of knowledge creation and the expression of wisdom to clusters of neurons and neural networks, which become engaged and active for a range of cognitive functions and tasks.

The Phd Project uses this epistemic transformation of Theory of Mind – to understand, analyze, synthesize and predict the business related behavior within the emerging Global Industry Development (eGID) sector. Theory of Mind (from a neurobiological perspective) can now explain the dynamics of the intensity of innovations, transformations, new business models, catalyzing structures, distribution systems, and solution integrators.

14.8 Chapter Summary

We commenced this Chapter by presenting the Bio-inspired strategy-making Model for Perception – focused Testing. As part of the Perception Testing we recalled the common bio-chemical, bio-epistemic legacy of all human thought. This included the stimuli from Academic Thought – leaders who have predicted the Future and their likely demands on strategy – making.

Beyond the explanations of how the Model would be able to satisfy these future demands, we also demonstrated how the Model offers a new paradigm of thinking. All knowledge artifacts and epistemic frames can achieve a Renaissance for SME relevance from the "Re-combination" of their DNA correlates.

We are now well positioned to enter Chapter 15 where the focus is on the power of the Renaissance in thinking as delivered by the Human Mind. Chapter 15 will complete the regime of testing to which the Bio-inspired Model has been subjected.

References

Barsalon, Lawrence W., 2008, Cognitive and Neural Contributions to understanding the Conceptual system, current Directions in Psychological Science, Vol, 17, No. 2.

CHAPTER 15 EVALUATION WITH CASE STUDIES

15.1 Introduction

This Chapter evaluates the Model's capacity to generate practical and innovative strategies by the "Mind-machine-embedding" of its epigenetic factors in 2 hypothethical but realistic cases.

While Chapter 15 provides the academic and scientific basis for the deployment of the Model in general, the separate Appendix 1 has been developed to provide SMEs with a practical guide to implement the Model that can satisfy their specific needs.

The strategy-behind-the-strategy of the Model's evaluation is a 3-stage approach.technological Minds of the OEM designers (that are embedded within the controls and operational features of the OEM's machines during its original manufacture) are "de-programmed" and evaluated in the context of the Model's epigenetic correlates. In the second stage, the Machine-mind is reprogrammed to incorporate and capture the benefits of epistemic re-framing of the Machine-mind. The new theoretical mind is embedded within the new controls required within the OEM machines that are now expected to work in an innovation-focused landscape. In the third stage, the Chapter explains how a new portfolio of break-out strategies can be generated from the Machine-Mind-adaptation, with specific reference to the SME-business ecosystem that could be mobilized and made possible by the newly generated emerging opportunities. The Model's practical evaluation further confirms its capacity to delvier the Schumpeterian concept of innovation through creative destruction.

In Chapter 11,12, 13 and 14 we tested the Bio-inspirational Model under a "human-brain" focused regime. The Model confirmed its capacity to catalyze human cognition and its scope to gain lessons from the source of all cognition – the Mind. In Chapter 14 Perception Testing – we specifically concluded that the Model possessed a strategy making capacity beyond the criteria to incorporate a range of though-leadership stimuli for the development of SME relevant strategy making capacity building. In addition we argued that a Wisdom Theory of Mind was the natural follow-on from the successes of perception testing regime.

In this Chapter the Bio-inspirational Model is being extended beyond the "human-mind" only, to include the "machine-mind". We seek to evaluate the Mode's capacity to "re-program" the machine's mind with a new "adapted mind-set" that extends the Machine's functioning and innovation potential beyond the expecations of the original designer during OEM manufacture. Specifically the Chapter also evaluates the Machine-mind-adaptationunder 2 SME modes of business strategy making

(i) Product development-based strategy, and
(ii) Service development-based strategy

This Chapter conducts and presents the results of the fifth and final level of testing of the validity of the Bio-inspirational paradigm. The dominant issue in this validation is the capacity of the paradigm to make use of the neurobiology the Mind and its capacity to strategically manage the

human ecosystem. The dominant mechanism need to be embedded within machines and systems that are being increasingly transformed in the global economy. The key challenge is to determine if the Bio-inspirational Model can be used to apply the "neurobiology paradigm" to ecosystem minds, machines and applied technologies for innovation development over the total life cycle in eGID.

In this Chapter two case study hypothetical examples are used to test the validity of the lessons from the bio-epistemic paradigm and the application of its nano-scale controllers, its engines, and its catalysts. In the first example, the Project involves SME functioning as the importer and Australian agent of a multinational corporation supplying injection moulding machines. In the second case study, the Research project presents the case of a SME involved with developing engine fuel conversion technologies to transform heavy diesel engines to operate on natural gas and more or less polluting bio-fuels. In both cases the Project exposes the new range of opportunities for strategy-making and innovation that is based on the neurobiology of strategy. In this Chapter the testing therefore focuses on the practical value of the new strategy-making paradigm.

In both cases, the hypothetical firms have reached a plateau in their expected levels of business success and their potential for advancement. This is a situation that typically confronts most SME and is therefore the subject for practical testing conducted in the Chapter. The Research Project applies the strategic thinking of the Bio-inspirational paradigm to the two hypothetical SME scale cases and subjects them to practical testing.

This application of the new strategy-making capacity involves using "the neurobiology of Strategy" with new approaches to the mind-sets of the SME, its ecosystem membership, agency personnel as well as the innovative products and services they develop. Effectively the strategy-making capacity under test is the transferring of knowledge and information from the "mind-set" of the bio-epistemic paradigm to the hypothetical strategy – making landscape.

15.2 Definitions of Terms and Concepts

De-programming of the machine-mind is defined as the process by which the embedded algorithms, operational functions and control strategies are analysed in the context of their capacity to deliver the Model's additional functions

Epigenetics – is defined as the study that focuses on the 98% DNA molecule that activates, directs and controls the 1.8% DNA that produces the correlates of the building blocks for strategy – making.

Epigenetic factors and correlates are defined as the Model's portfolio of convergence-abstraction conditions of state and thematic validators, for use in, and the renaissance of strategy-making in emerging industries.

Epigenetic markers – are defined in the context of being bio-chemical markers that are affixed on the DNA molecule to initiate, curtail, silence or control the correlates of the strategy – making building blocks.

iPSC – Induced Pluripotent Stem Cells – are defined in the context of being stem cells (or building block – entities) whose epistemic / bio-chemical markers have been reset, so that innovative version of the original entities can be recreated or reformed.

Machine-Mind is defined as a construct that

OEM is defined as the Origianl Equipment Manufacturer of the machines used by SME businesses, as the basis for strategy-making and implementation

Embedded Mind-machine correlates are defined as the collection of digital and electronic control systems that together deliver and implement the new functions for the re-programmed machines

Stem cells – are defined in the context of being entities or building – blocks in their most configurable from so that they can thereafter deliver dedicated function, as adult or nature cells.

Stem cell differentiation – is defined in the context of the conversion/ transformation/ configuration process to obtain dedicated functioning from the differentiated stem cell. The differentiation is achieved by the setting or re-setting of the epigenetic markers on the 98% DNA molecule.

Methylation of DNA – is defined as one of the Epigenetic bio-chemical marker systems that are used to switch the 1.8% DNA genes on or off.

5-m Cytocine – Methylcytosine – is defined as a specific methylation DNA marker that turns genes off.

5-hm Cytosine-Hydroxy-Methyl-Cytosine – is defined as a bio-chemical marker that signlas the 1.8% DNA gene for the expression process to commence the protein building blocks.

Mind–Brain interactions are defined as the bio-epistemic processes forming part of the stimuli – Mind – Brain – Behavior chain that is involved in correctly implementing the protein building/ signalling processes.

Mind–Mind interactions – are defined as the correlate of not just doing things right, but also doing the right things.

Mind–Minding metaphor – is defined as the bio-inspired message for re-programming or transforming existing mindsets, entities and building blocks to become more innovative and relevant for the Post – 2000 eGID landscape.

Recombinant DNA – is defined in the context of the metaphoric lessons from the study of Genomics whereby nano-scale type DNA elements are inserted into the DNA-genome to achieve innovation or transformation of the original function. In the correlates of business strategy, the Model's bio-epistemic catalysts are used a "Re-combinant" DNA elements to reprogram Pre-2000 building blocks for Post-2000 eGID relevance.

15.3 Epistemic Mind-machine approach & criteria for Practical Test and Model validation

In this section we reflect on the progress of the bio-inspired Model and its transformation and lesson delivery from metaphoric parallels to Mind – Brain – Behavior management. The final stage of the Model is the potential offered for Mind – Mind transformation for strategy – making.

15.3.1 Mind – Mind Transformation for strategy – making

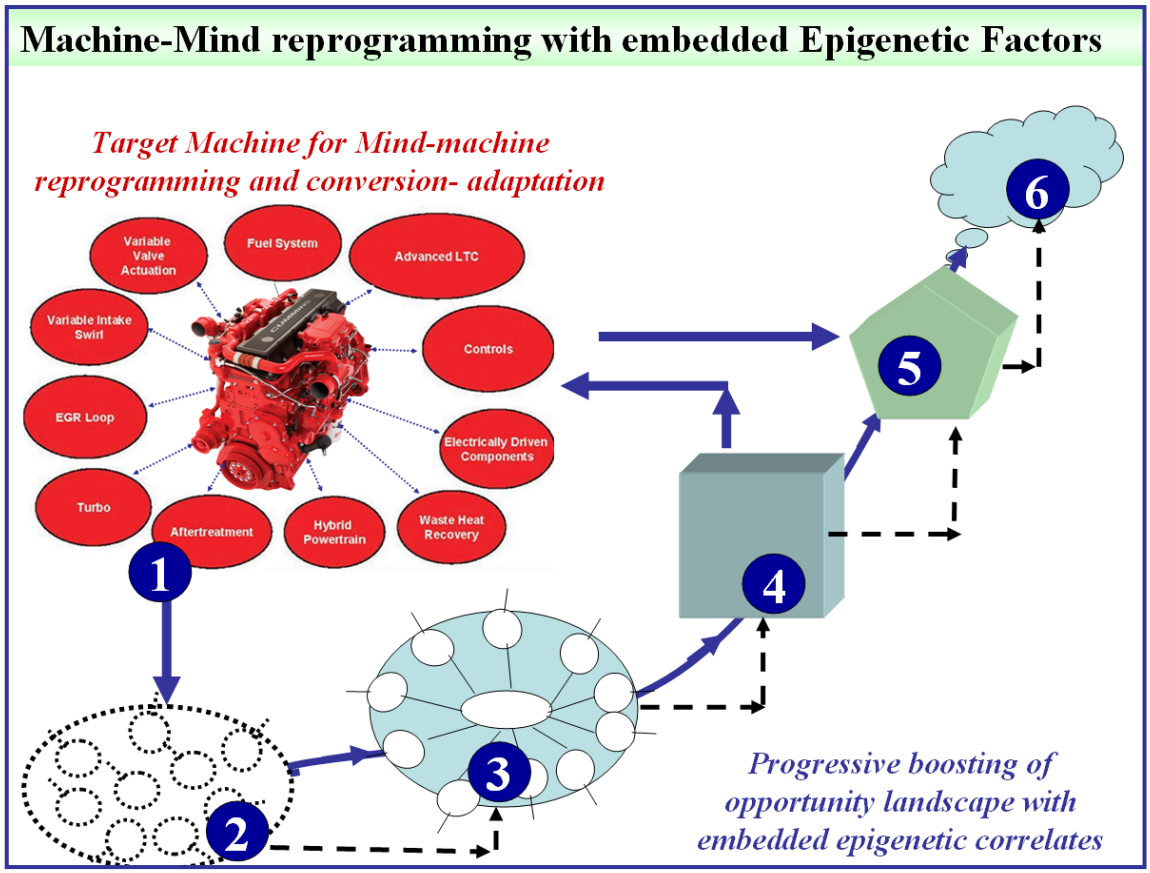


Figure 15.1 Mind-machine application of the Model with embedded epigenetic factors

Figure 15.1 illustrates the Ascent Routine through which the Model progressively can take a Pre-2000 business resource or entity and render it suitable for use in the Post-2000 emerging landscape . Both the initial and final metaphors (ie.parallels with between strategy-making and protein synthesis and neurobiology-based neuronal circuit syntheis) offer an ascent routine for the advancement of concepts to achieve higher order innovation and success in emerging industries.

Item 1 in the diagram illustrates the range of Pre-2000 issues and abstractions that have been embedded within the Pre-2000 artifact, whose embedded knowledge is to be upgraded and enhanced for Post-2000 rigour and relevance. In metaphorical terms this represents the Pre-2000 status of the science of Biology (Item 2). This Pre-2000 version of knowledge is captured using digital sensing technologies, real-time database storage and simulated operating conditions.

Item 3 represents the physical testing and the capture of the data that is in effect the embedded mind-set of the Origianl Equipment Manufacturer's design (OEM). This the mind of the Machine that becomes the Unit of Analysis for the application of the Model's catalytic factors.

One the Mind-sets of the OEM are captured trhough operation simulation, the analysis of the Pre-2000 deficiencies or the limiting factors can be carried out in the context of their compliance with the Model's epigenetic correlates. Item 4 is represents the re-programming with the Model's adaptation. Item 5 represents the new Growth Development Platform that can be created with the Re-grogrammed Machine, now capable of operating with new fuel systems, or with new protocols, or new outcomes. The new innovations from the Model's "creative destruction" and its propensity to attract members to a new business ecosystem that can operate in emerging industries is illustrated in Item 6

The diagram represents the increased capacity for strategy–making with the increased availability of epistemic feedstock, perspectives and memberhips and mind-sets that can then be further developed for eGI success.

The bio-inspired knowledge curve achieves wisdom status from the progressive addition of lessons from the 98% DNA functional elements (the epistemic catalysers), the Mind – Brain dynamies, the neurobiology of through and stimuli, and other correlates of epigenetic markers (such as 5-ml and 5-hmC) and micro-RNAs, etc. At the peak of the curve is the ultimate Mind – Mind status to which SMEs can aspire.

15.3.2 Lessons from Induced Pluripotent stem cells (iPSC)

The peak of the bio-inspired knowledge curve is the potential whereby the bio-inspired Mind can be used to reprogram or mind the Minds of the strategist and all ecosystem members.

Lessons for "Minding the Mind" of the ecosystem directly result from the technologies underpinning the iPSC domains. Adult – skin cell, and mature cells from the human gut and the heart, have been reprogrammed and transformed into stem cells, with a new capacity to be able to function differently with innovation or renewed relevance.

Stem cells are the equivalent of new building blocks that can be epistemically re-configured to deliver the new functions obtainable from the alteration of their 98% DNA bio-markers.

15.3.3 Schumpeterian Creative Destruction for Innovation

It is coincidental that Schumpeter's treatise on innovation through spirals of creative destruction and re-construction was being developed at the same time when the DNA molecule's secrets were being unravelled. Schumpeterian innovation is simply the play-out of the re-framing, and the re-configuration and the re-presentation of earlier concepts and artifacts whose performance and functions can be improved by new Mindsets.

In Schunpeter's theories, technology is the catalytic transformer. Older capital, labour and land-utilization practices are upgraded with new approaches to using technology – which in turn delivers the replacement innovations.

15.3.4 Knowledge Renaissance from the Mind – iPSC paradigm

By contrast, the Bio-inspired Model offers the Mind as the real – driver, the ultimate catalyst for the growth of the knowledge curve and resulting strategy – making innovation. The Mind metaphor and ultimate driver, operating in the framework of the iPSC paradigm can creatively transform and generate new Post-2000 strategy-making.

The Renaissance of knowledge for strategy – making emerges from the Bio-inspired Model's concept of the Mind of the SME seeking to reframe the Minds of the required business ecosystem membership.

All of the prior – artifacts (in the form of the Information Tsunami and the 100 year - $1 Trillion knowledge base) can be similarly be transformed in the Renaissance Paradigm for Post-2000 eGID relevance.

15.3.5 Bio-inspired lessons for Minding the Mind

Potential of the iPSC domains and their technologies are being actively harvested in scientific research for Post-2000 solutions in Regenerative Medicine, Cancer-oncology, and Therapeutics – both at the industrial appreciation levels.

iPS Cells for cartilage and Tissues Engineering are being re-programmed with bio-chemical 98% DNA markers to function as mature cells to replace damaged tissues. The potential for reprogramming brain cells (neurons) are being actively researched for solutions to Alzheimers, Parkinsons and Huntington diseases. Technologies for the bio-marker embedding are simultaneously being actively researched.

15.3.6 Combination of Marker – Catalysts and Embedding technologies

The key to success of the Mind – iPSC paradigm is the combination of successful neuro-catalyst selections and their embedding within the neurons. The same mandatory requirement applies to the bio-inspired Model ie the selection of the appropriate epistemic catalysts and the proper embedding of the catalysts into the building-blocks that need to be reconfigured.

15.3.7 Bio-epistemic catalysts and building blocks for Renaissance

(i) In the earlier Chapters, this Project has presented examples of the epistemic catalysts such as agility, accountability, identity, integrity, mobility, visibility, etc

(ii) The power of the English language and their epistemic relationships (per MIT Professor Norm Chomsky) offers a full lexicon of such catalysts. A complete list of over such words (ending in "ity") is available in the English dictionary. A sample is contained in Appendix A.

(iii) Chapter 2 has presented the list of strategy-making building blocks, that have been accumulated in the 100 years and the $1 Trillion investment.

Their Renaissance and Creative Destruction emerge from the combinations of the epistemic catalysts and the building blocks within the micro-environment of the Model's Epistemic Engine.

15.4 Methodology and Basis for Selection of Case Study SMEs

In this Chapter we subject two hypothetical SMEs to practical case study type testing. It is acknowledged in the case study that both firms have in theory reached a plateau in their level of performance. Both firms need to adopt radically different strategies if they are to advance beyond this plateau.

As a part of this test, the Research Project proposes the embedding of "bio-inspired" strategic mind-sets to the two hypothetical Case Study SMEs. In effect, the practical test situation involves the testing of the strategy-making approach advanced by bio-inspiration. This involves epistemic embedding within the two SMEs the new strategy-making mind-set, and testing whether it assists the SMEs to break-out from the performance limiting plateau.

15.5 Strategy-making "break-outs" from the current limitations that can be achieved by the application of the Neurobiology paradigm

The "Mind iPSC paradigm" essentially seeks to integrate new approaches to strategy-making by the integration of epistemic parallels from the concepts of

(i) "Theory of Mind" and the use of the Paradigm's mechanisms to gain understanding of the mind-sets and the mechanisms within the resources and membership of the business ecosystem and the operating knowledge gaps

(ii) "Mirror Neuron mechanisms for Accelerated Learning" from the thought leaders and successes of others. The Mirror Neuron mechanism applied to the SME context of strategy-making presents a new approach to mimicking and learning from the success of others. Lessons available from thought leaders and innovations within products and services are the best available sources of lessons for learning, consideration, inductive and deductive reasoning and adaptation. The parallel transfer of the benefits of this mechanism offers new challenges, but it offers rich benefits and fast tracking of learning

(iii) "Neural Circuits" associated with the mind-sets of the competencies of the different members of the business ecosystem and from world best examples of strategy-making. Their individual neural circuits provide the individual epistemic building blocks generated from their natural base of core competencies and core capabilities. The neurobiology paradigm seeks to combine these neural states of sub-concepts and sub-models into the level of advanced strategy making.

(iv) Neuronal convergence pathways for continual and dynamic integration for exemplar-class strategy-making to be achieved

(v) The addition of the SME context neuronal navigation of the neural circuit development through a better understanding of the neural circuit dynamics taking place in the eGID global landscape.

(vi) Neural dynamics for the visualization and understanding of the "exemplars" of neural circuits in the global business landscape provides the required mechanisms and the targets for advancement through the zones of proximal development through the Blooms Taxonomy challenge. "Synaptic Dynamics" mechanisms provide the lessons for the developmental activities and the functional transactions required in the operationalization of strategy-making paradigm. The lessons are offered by the neurotransmitter proteins, and their role in the development and formation of the portfolio and ecologies of neural circuits. As well the action of neuro-protein controllers such as the microRNA bio-epistemic parallels are crucially important for the strategy-making processes.

Theory of Mind also provides "bio-inspirational" lessons beyond their operational level, by adoption of a meta-level position. This is because the Bio-inspirational framework offers itself for advancement of the Mind iPSC paradigm.

The meta-level positioning enables the SME to proactively predict the thought knowledge and wisdom-driving processes that are causing the upheavals to which SMEs are being subjected in PESTE and eGID landscape.

Also the meta-level analysis enables the capture of unexplored areas in which the SME core competencies can be combined to achieve enhanced commercial value and strategic positioning

15.5 Practical Testing – Case Study 1

This section presents the hypothetical case of a SME involved with the development of Natural Gas Engine Conversion technologies and how their strategic opportunity landscape can be magnified by the suggested adopted of the Bio-inspired Model.

Segments of the Model's recommendations are currently being implemented and a 2-3 years timeframe could be required to capture all of the Model's strategy-making benefits.

15.5.1 Problem Definition - Existing Strategic Situation

The hypothetical SME has been involved in developing technologies that would convert existing high capacity diesel engines to be retrofitted for Natural Gas operation. Diesel has been the fuel of choice for over 100 years (from the time of its inventor Rudolph Diesel). The fuel possesses the required chemical characteristics to convert its chemical energy into kinetic energy and hear energy.

The Diesel fuel operates with the compressed Ignition cycle, where in compressed air is ignited and combusted with the diesel fuel. The resulting power outcomes are superior to the Petrol Engine operating on gasoline or LPG fuel. The Diesel's outcomes are difficult to achieve with other alternate fuels such as LPG, or Natural Gas (in the form of compressed Natural Gas – CNG; or as Liquid Natural Gas (as LNG at -160^0C cryogenic temperature).

15.5.2 Key innovation for Creative Destruction

The hypothetical SME has over the past 15 years sought to develop diesel to Natural Gas (CNG and LNG) technologies with varying degrees of success. The success of the Fuel Conversion Retro-fit technologies are measured by the alternate fuel's capacity, to generate the same range of performance criteria such as Power – to weight ratios, Power-Engine speed relationships, Torque – Engine speed characteristics, and Fuel efficiency.

Importantly the need for the LNG/ CNG innovation also arises from Emission Controls and Low Carbon Footprints for sustainability. These diesel engines are comprehensively used in heavy transport in trucks, buses, road tankers, construction equipment and power generation.

15.5.3 Challenges to SME for commercializing the Innovation

As a result of its decode of R&D, the hypothetical SME now possesses a suite of conversion technologies that are packaged into a Retro-fit Conversion kit. In Pre-2000 strategy-making approaches, this outcome could be seen to be the end in itself. In the Post-2000 eGId landscape however, the success of creative destructive potential need to be considered within a total system that includes the inventor, the installers, the buyers of the Retro-fit Conversion systems, the suppliers of the replacement LNG fuel, Third party Logistics Providers (3PL), End-user customers of the logistics services delivered by the 3 PL, and environmental regulators, OEMs, and regional zones, etc. The challenge is to satisfy the needs of all of the stakeholders which would and only then result in orders for the purchase of the conversion Retro-fits.

The challenge of obtaining convergence in thinking and agreement within the business ecosystem is significant especially from the financial perspective. At an average hypothetical conversion cost of $100,000 per engine, typical investments of $5 to $20m would be required from vehicle fleet owners or 3PL providers to secure the benefits of the conversion technologies. These benefits range from the scope to:

(i) Capture fuel cost savings (LNG is 35% the cost of the Diesel fuel being replaced)

(ii) Reduce Exhaust Emissions by 20% for environmental improvement

(iii) Reduce Noise levels by 25%, and

(iv) Reduce Maintenance and Parts/ Consumable costs by 15% to 20%

15.5.4 Three levels of SME strategy-making challenges

(a) SME – knowledge base
At the first level, the hypothetical SME has to develop the expected portfolio conversion technologies for retrofit use with a range of engine OEMs such as Cummins, Detroit Diesel, MAN, Mercedes, Ford, etc

(b) Local Response Ecosystem knowledge base and membership
At the second level, the hypothetical SME needs to integrate the knowledge of the comptemting suppliers, service providers and end-users in the locality of the Melbourne metropolis.

(c) Global eGI-landscape for strategic development
At the third level, the hypothetical SME-local ecosystem membership needs to expand and grow the opportunity landscape for the Post-2000 e-DI Domains of the Global transport sector.

15.5.5 Triple Level Challenge for Bio-inspired Model

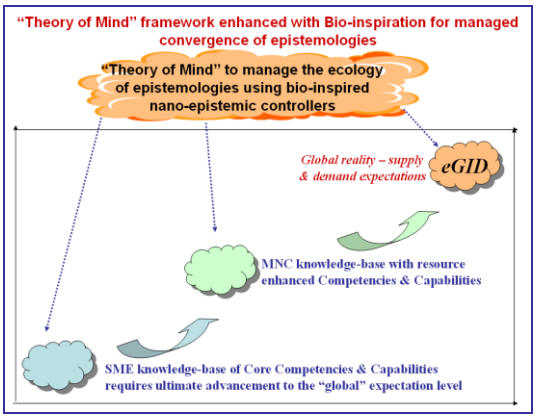


Figure 15.2 – Triple level challenge for Bio-inspired Model testing

Figure 15.2 illustrates the triple level challenge confronting SME strategy making and the approach being offered by the Bio-inspired Model for solution delivery.

(a) At level 1 for example, lower base of diagram, the challenges largely relate to the SME development of the conversion technologies – which requires the new Post-2000 thinking offered by the Model. Precision control is required to match the performance of the

Diesel Engine in its OEM status before its fuel is charged over to Liquid Natural Gas (LNG). Figure 15.3 lists some of the problems that need to be resolved with the Mind-Machine deprogramming.

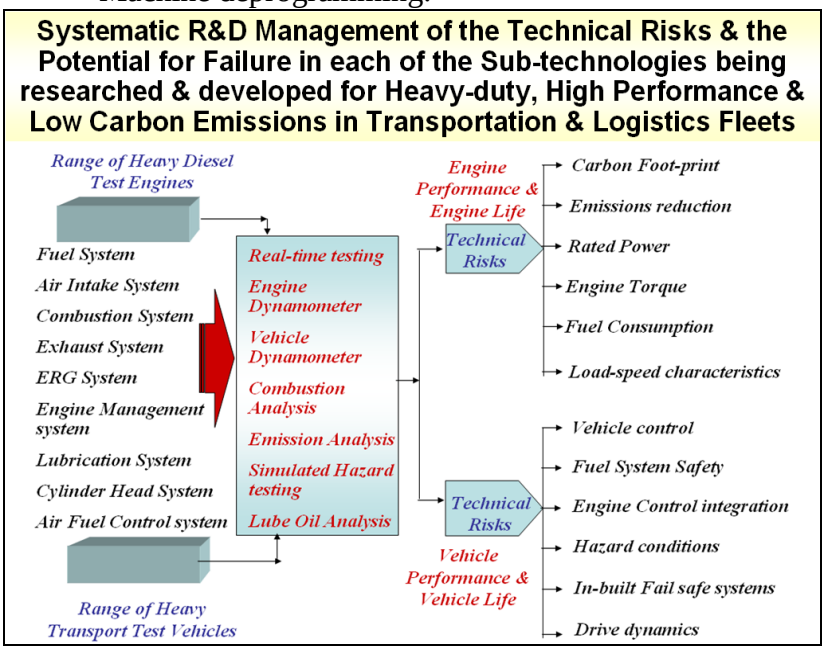


Figure 15.3 – Level 1 Practical Test and SME challenge

The hypothetical SME needs to utilize the Epigenetic-catalyzed Model to break away from the Pre-2000 product – innovation-centric approach, in which the SME would typically invest and carry all of the risks of isolated development.

(b) At level 2 (middle of illustration) the SME narrative needs to mobilize a locally responsive (I-R Grid of Prahalad) ecosystem that can demonstrate the whole of life (whole of genome functionality) of the new innovative conversion technology portfolio.
Here the focus extends beyond the Mind-mobilization of the SME at the factory level. The mindsets of decision – makers at the local ecosystem need to be mobilized for individual and common benefit; and

(c) At the third level (upper right), the message delivery system for global commercialization needs to be focused on global-opportunity decision makers.
The Figure also illustrates the rising level of challenges faced by any intending user of the Bio-inspired Model.

15.5.6 Level 1 solutions from the Bio-inspired Model

In the hypothetical case, the physical action being analysed (that have been carried out by the SME in the Pre-2000 mindset) are being reframed to demonstrate the transformative power of the Model's interventions and the unique perspectives offered.

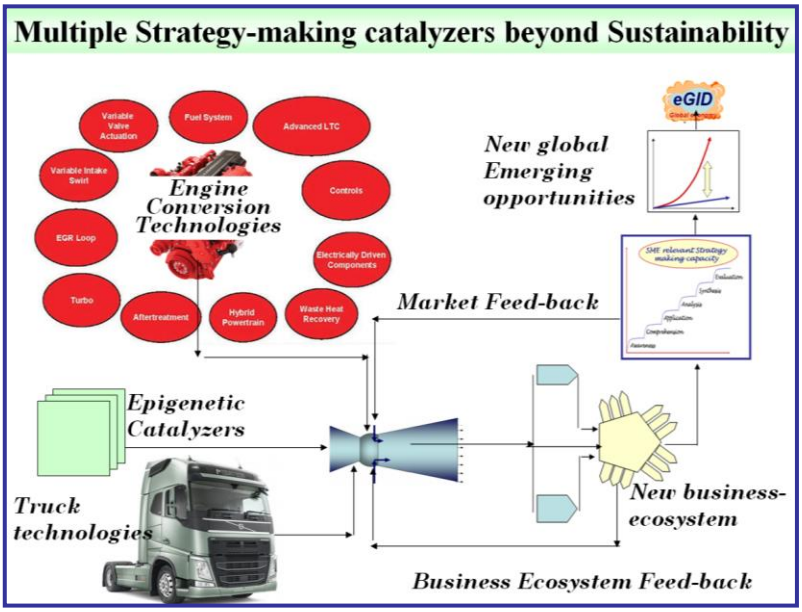


Figure 15.4 Catalyzing, multiplying and transformative potential of the convergent-abstraction effects of the Epigenetic-Mind-Machine strategy

Figure 15.4 for example illustrates how the initial Engine Conversion Technologies (top left) generates multiplying and cascading effects once its Mind-machine abstractions are aligned with the Model's Epigenetic Machine. Collective inputs and considerations become automatically highlighted on the expectations and scope for joint participation from OEM Truck Manufacturers, LNG fuel suppliers, LNG fuel Distributors, Road-logistics operators, industrial and consumer manufacturers, Retailers, Financiers, and Road Service providers, etc. Further they become the natural members of a mutually supportive business ecosystem that derives their strength from the abstracted conditions of state resulting from the SME's Fuel Convervsion Technologies. The technical challenges in new ecosystem portfolio extends beyond the nine listed subsystems of air, fuel, combustion, oil, cooling, exhaust, etc. However the opportunity space and potential for success in emerging markets expands rapidly with this transformation. Epigenetic factors such as Capacity, integrity, mobility, profitability, reliability, sustainability, usability, visibility, etc, are the catalysing factors that are of appeal to the formation of the business ecosystem because of their Mind-machine linkage with the core expectations of the members.

15.5.7 Applying the Model's Mind-management perspectives

The precision control technologies created by the OEM of the original Diesel Engine (prior to conversion) represent the "Mind" of the Diesel – OEM. During the past 5 years, the SME has sought to capture these controlling actions, so that where relevant they can be retained and replicated by the equivalent conversion technology management and control systems being developed.

Essentially the correlates of the metaphoric "genome – Mindsets" are embedded within the OEM-Engine Management system. The Bio-inspired Model offers a unique perspective on the actions of the SME in their R&D with learning and mimicing the OEM's genome.

The Bio-inspired Model's perspective both acknowledges the R&D work of the SME and elevates it to a new domain of higher order thinking, as follows:

(i) "De-programming of the OEM Mind set" has taken place by the SMEs computer-based recording of the candidate OEM engines being scheduled for technology conversion

(ii) The genome of the original OEM is altered to deliver a new portfolio of LNG fuel control signals, together with the addition of new hardware

(iii) The performance of the new genome is documented by testing the conversion prototype

(iv) Repeats of the genome re-combination and changed "controlling genes" continue until the converted engines new "Mind" delivers the target performance.

15.5.8 Successful Mind-swapping perspective

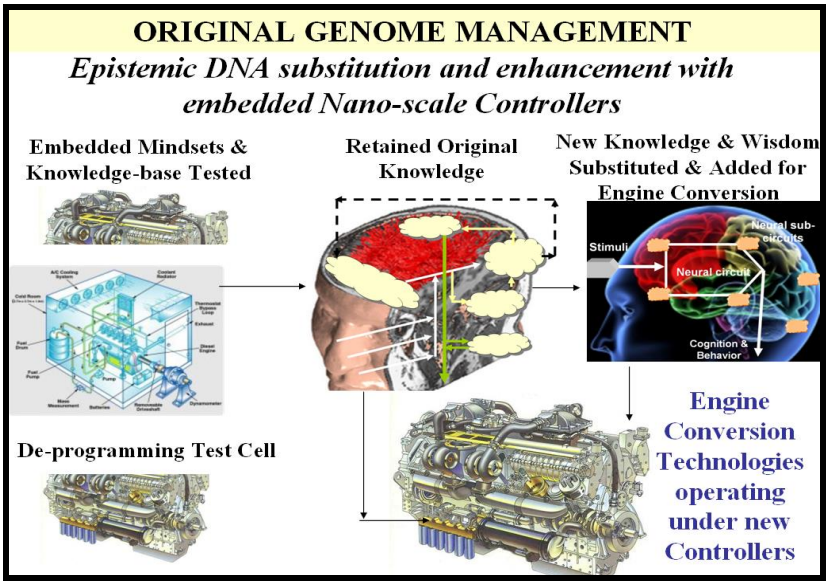


Figure 15.4 – Mind Swapping strategy in level 1 Practical Test

The role of Model's genome – Mind – Brain perspective is illustrated in Figure 15.4. The six domains illustrated work in tandem – each reinforcing each other. The original Mindset of the OEM (lower left) is transformed into the conversion system (lower right) through the active intervention of Mind- Brain – Genome recombination and active analysis of the new genome in the test cell dynamometer(left middle).

The net result is that the conversion technology's Engine Management System possesses a new Mind – Brain with the new capabilities of reliability, visibility, integrity, and identity of each of the performance inputs and variables.

15.5.9 Extending the Model's "New Mind – Brain" for ecosystem mobilization

The Model's genomic – based perspective on the conversion technology offers a unique value – proposition for message delivery and recruitment of local business ecosystem members.

The message – concept of a "creative – destruction – innovation" can assist ecosystem members to relate to the new conversion technology as a common platform for solution delivery of their respective challenges (associated with their continued use of Pre-2000 OEM – Diesel systems).

Figure 15.5 – Mindset sharing with Bio-inspired Model

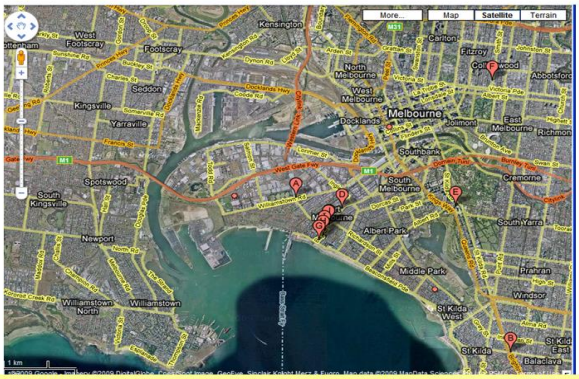
Figure 15.5 for example illustrates the transport – servicing landscape of the Melbourne metropolis. Currently Pre-2000 technologies are being used to deliver supplies to the 1000+ retail sites. Consumables (long life and fresh produce) need to be delivered from warehouses and Distribution Centres.

The Model's scope for presentation of the conversion technology as the new Post-2000 Intelligent Transport Delivery will be well received because it is based on the successful "Brain – transplantation" concept.

Decision – makers can relate to the brain – mind transplantation metaphor, and as a result they are likely to respond more positively to the invitation to join SME – ecosystem membership.

15.5.10 Sustainability solutions from the new Epigenetic–Mind–Brain transplantation

The Model's appeal extends beyond the benefits of fuel cost saving and operational/ maintenance cost reductions. Figure 15.6 for example illustrates the scope for the conversion technology's new Mind – Brain – Genomic transplantation to resolve a major local pollution problem.



Some 5000-8000 container trucks service the Port of Melbourne each day.

The Port of Melbourne has been held accountable for the Environmental Impacts of of its decision to deepen the shipping channels in Port Philip Bay.

The Port of Melbourne Authority as well as the GasTech Technology supplying company are idea partners within a Business Ecosystem.

Both firms could facilitate the conversion of the Heavy Diesel Engines that are operated by their 3PL logistics Contractors (sucah as TOLL, P&O, LinFox, Kleelands, etc.)

Figure 15.6 – Bio-inspired Model delivering sustainability solutions

More than 5000 diesel fuel trucks pass through this suburb causing major concerns to local residents from their diesel – corciogenic pollutants. The message of the new Mind – Brain – Genome as a possible solution to pollution and noise reduction would be well accepted.

In addition local government, the Port of Melbourne and Transport operators would all be more accepting of the need for a bulk – conversion program to be mandated.

15.5.11 The Global attraction to the Model's perspective

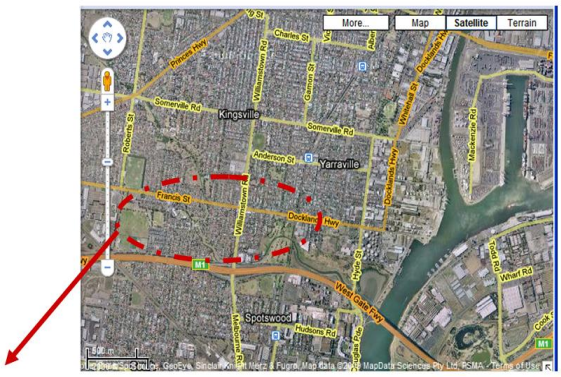
The same message can be extended globally with the result that the number of conversion fits required would be magnified. The Port of Long Beach in Los Angles for example has mandated the requirement that trucks transporting shipping containers must utilize "Green Technologies".

The message from Bio–inspired Model extends beyond being green. It epitomizes intelligence that actively benefits from Mind – Swapping, convergence of technologies, ecosystem – based total – solution delivery and a Post-2000 answer to sustainability and climate change.

15.5.12 Global applicability of the Bio-inspired Model

The dominant lesson from the Model's intervention into strategy-making is that global audiences would be well accepting of the re-framed messages or descriptions of SME activations in the making.

The changing of stakeholders mindsets to accept potential solutions for climate change can for example, be universally applied to other countries. Figure 15.7 for example, of intensified local pollution around ports, transfer stations, and transport centres can be applied to almost every country interested in using Liquid Natural Gas for pollution reduction.



The most air-polluted area of Melbourne is the Francis Street, Yarraville suburb. Heavy Diesel Trucks pollute the air at levels monitored by the EPA with little solutions possible.

The Trucks service the Oil Refineries and the Port of Melbourne.

The Conversion Technologies can eb applied here using the Bio-inspired Business Ecosystem Model. A "Multi-sided Platform" approach would benefit from the mandating of GasTech type conversion technologies being used to convert the Diesel Engines to operate on the less polluting Compressed Natural Gas or LNG or LPG

Figure 15.7 – Solutions for pollution reduction

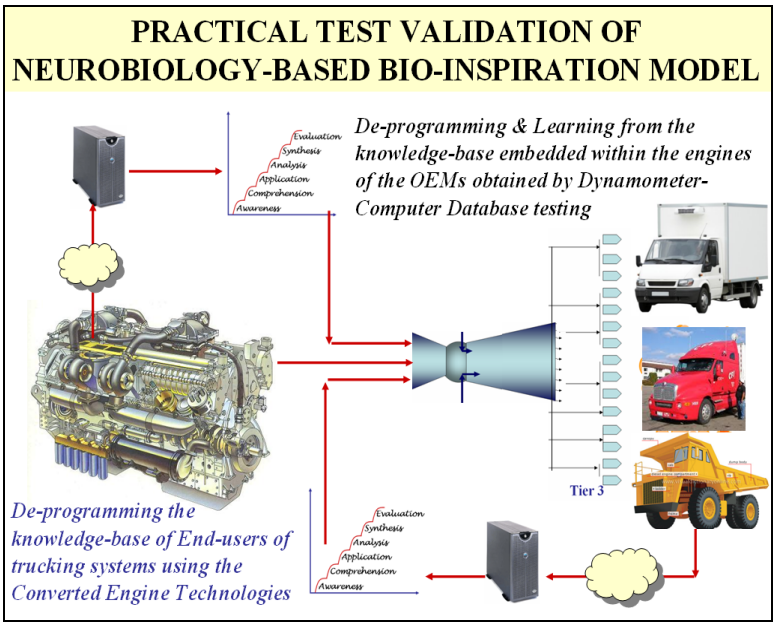


Figure 15.8 – Global applicability of the Bio-inspired Model

The SME conversion technology offering would also be well received from Original Equipment Manufacturers of trucks, bus-transportation, construction equipment, and mobile plant and equipment currently operating on polluting diesel fuel. The attraction to other ecosystem members such as regulators and financiers, etc will further expand once quantitiative data on the different epigenetic factors or performance measures become available as a result of the necessary monitoring of the new LNG systems, once they are retrofitted.

For example Figure 15.8 illustrates the extension of the Model to document the "theory of Minds" of the operators of the deprogrammed – Re-minded technologies. In the recommended follow-up project for the SME, converted vehicles would be RFID tagged and their performance recorded. The visibility and integrity of the technology once recorded would generates further incentives for SME sale expansion.

In the right of the diagram, such 24/7/365 day monitoring could be applied to test cases in each of the target sectors. In conclusion it could be argued that the Bio-inspired Model delivers integrate benefits to all three levels of analysis.

15.5.13 Practical value of the Bio-inspired Model

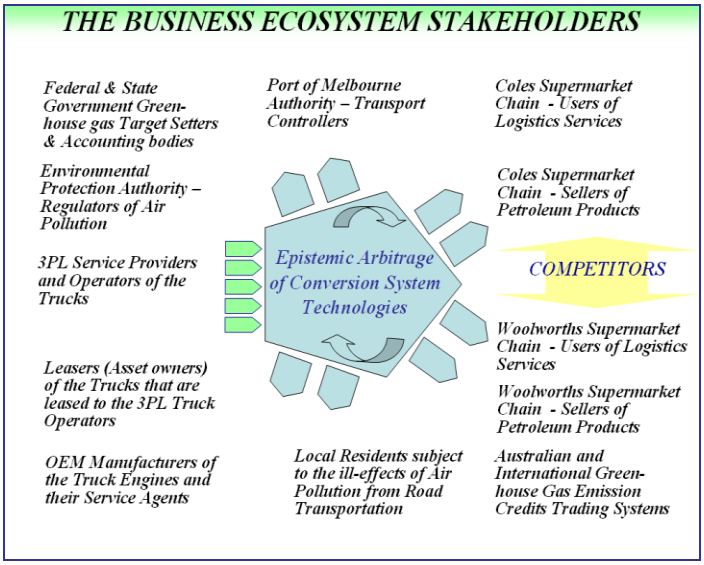


Figure 15.9 – Practical Test with Ecosystem perpective

The Practical Evaluation exercise concludes that the Model does indeed offer significant potential to assist SMEs develop strategy-making options that can deliver success in emerging global industries. In this Case Study, the evaluation success can be attributed to the cascading linkages and impacts of the Model's Epigenetic Factors.

At the micro-technological level, convergence-abstraction at the machine level translated into the opportunity to capture the Mind of the OEM designers and use this as the launch-platform for further strategy-making successes. Conversion technologies become more focused and achievable in the context of the "epigenetic abstractions". These correlates become the Units of

Exchange with potential business ecosystem members, who are required by SMEs if their risk portfolio in technical risk and investment risks are to be shared.

Figure 15.9 illustrates the range of potential ecosystem members whose mutual interests become the glue for joint action and joint success with a much higher probability of success. The Epigenetic facots not only focus attention on the key strategic issues that need to be managed but they also align the disparate inputs and resources relevant to the thematic functions associated with each of the Model's epigenetic factors.

15.6 Practical Testing Case Study 2

15.6.1 Problem Definition - Existing strategic situation

In this case this hypothetical SME firm has been in business for over 10 years. Its business model is contractual functioning as an importing agent and vendor for new Injection Molding Machines (IMM). The users of these IMM are generally a common area of SME involvement. Once purchased, the IMM owning SME produces plastic parts, components and end-products for purchase and use by consumers and industry-buyers. Common examples could include plastic garden tools, plastic plates, plastic tanks, toys, etc. The injection moulding machines are a key piece of infrastructure required by these SME firms.

The manufacturing of such Injection Moulding Machines (IMM) has ceased in Australia since the 1980s, and Australian SME manufactures of product made by these machines are reliant on the supply of such machines from overseas based equipment manufacturers, ie. the Original Equipment Manufacturers (OEMS of IMMs). Such overseas-based OEMs need local marketers and vendors and service providers for the sale and support of their IMMs in importing markets such as Australia.

The selected Case Study Firm 1 is typical of the type of local sales and service support delivered by representatives or agents of overseas based OEMs of IMMs. The Case-study Firm1's business model requires them to continually sell new replacement machines, and provide spares for machines already in the field. The core Customer Value Proposition in the conventional approach to strategy-making is to make these available at lowest cost, in time, and without risk from poor performance and functional break-down or failures.

15.6.2 Key Innovation potential from local position

The Prahalad "Integration – Local – Response" concept in the I-R grid, as per Figure 15.10 illustrates the position of the hypothetical SME – Agent.

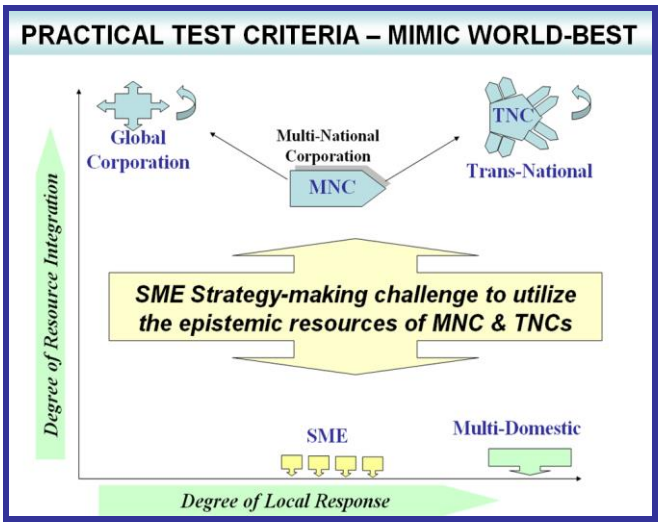


Figure 15.10 – Practical Test for SME Model intervention

Figure 15.10 presents the epistemic position of the different types of corporate enterprises on the Integration-Local Response Grid (or the I-R Grid). SME firms are at the base of the diagram with a relatively high capacity to deliver customer service levels that can sometimes exceed that of multi-nationals (in the upper level of the diagram). The epistemic challenge is for the SME to work with and or utilize the considerable resources of the multi-nationals (middle of the diagram). The Bio-inspirational paradigm seeks to provide SMEs with a relatively simple approach to catalyse and harvest the resources that have been generated by the multi-nationals.

MNC manufacturers of the IMMs are reliant upon the local information of end-users on how their respective machines perform. The hypothetical Agent is therefore in an advantages position to obtain data on visibility, usability, reliability, and integrity, etc of the IMMs sold.

Each of these data-domains need to be recognised as knowledge domains that need to be managed in the Post-2000 era with suggested intervention of the Bio-inspired Model.

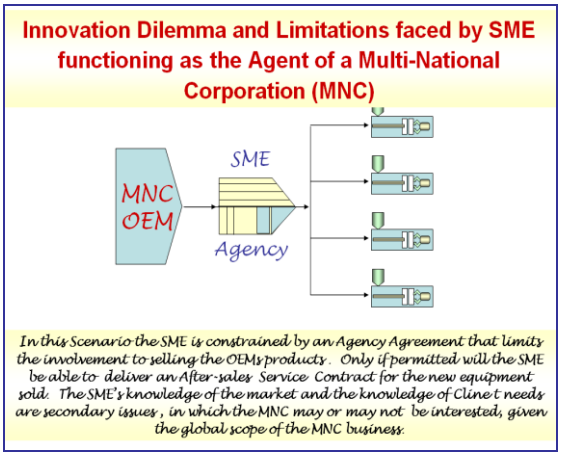


Figure 15.11 – Pre-2000 limitations on SME

15.6.3 Challenge to SME commercializing local knowledge

With the exception of the "reliability" factor, the potential to use most of the other catalysing factors are generally neglected. Figure 15.11 for example, the SME agents limits involvement to supplying the IMM and consumables with related Maintenance Management Services. SMEs are effectively in a cash- trap. They need to re-sell the new IMMs at the lowest price and if they raise their maintenance costs to compensate, they would lose out on repeat business.

15.6.4 Three levels of SME strategy-making challenges

The Bio-inspired Model offers SMEs the opportunity to break-out of this cash trap at three levels:

(a) SMEs need to develop new knowledge platforms for all of the range of OEMs and machine specific IMMS being sold in Australia

(b) The SME needs to develop new knowledge on the operational management dynamics of the End-user, and

(c) SME need to become familiar with the Global landscape of IMM OEMs around the world.

15.6.5 Level Solutions from the Bio-inspired Model

In Figure 15.12 for example it is recommended that the SME utilize the Internet and Web technologies for data capture on the visibility, usability, reliability, agility, and creativity of end-users operating with the IMMs sold through the Agency.

The wealth of knowledge provides data not only for a IMM Machine – health focus, but also for capturing data so that comparisons and decisions can be made based on hard evidence.

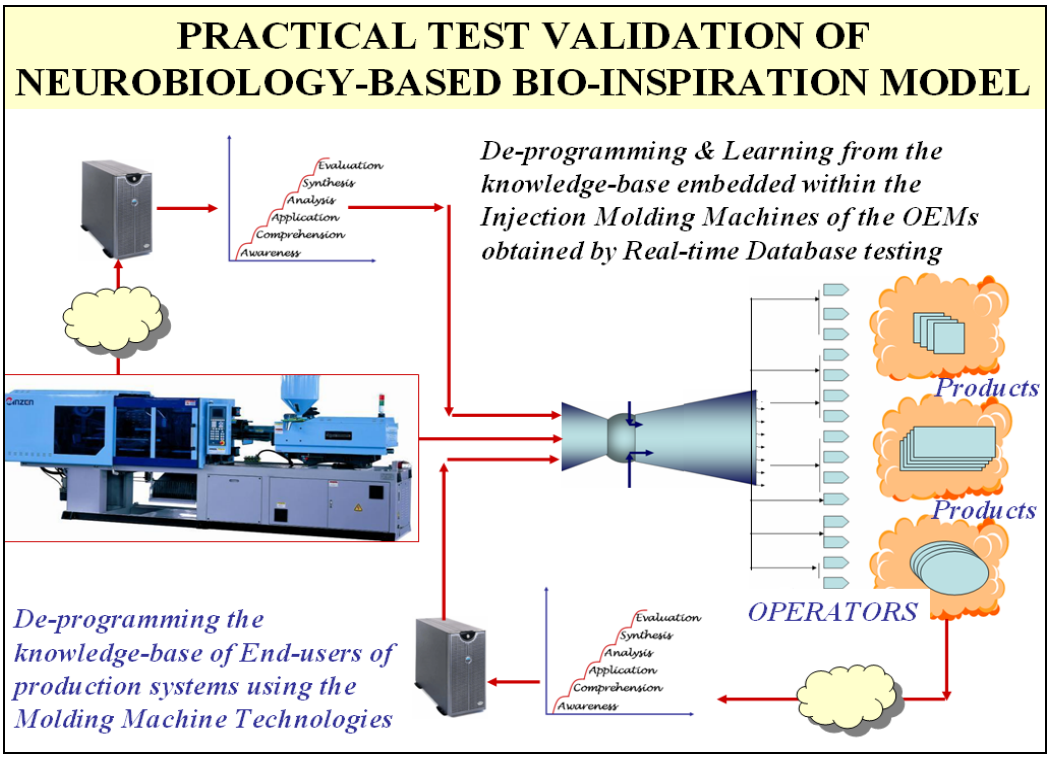


Figure 15.12 – Capturing knowledge for new Machine – Mind controllers/

15.6.6 Applying the Model's Mind – management perspective

The Model's recommendations on achieving recorded visibility agility, creativity, etc can be directly applied to advice global OEMs on the requirements for "new Minds" of their future range of IMMs.

This will be made possible in the context of determining how the existing Minds of the IMMs (ie their Pre-2000 and PLC – based controls) are performing.

15.6.7 Successful Mind – swapping perspective

The intervention of the Bio-inspired Model offers the potential for IMMs performance to be upgraded through Mind – Swapping.

By using the recommended 24/7/365 knowledge – system repository, SMEs can convince the IMM OEM to upgrade from PLC systems to full computer controlled functions Mind – Swapping with the new operational management genome offers the potential to:

(i) Reduce Cycle times
(ii) Reduce start-up wastes in each new production run
(iii) Increase the amount of Recycled plastics that can be introduced in the feedstock, and

(iv) Reduce energy requirements and carbon foot-print of the end-user's manufacturing operations and that of their product portfolio.

15.7.8 Extending the Model's new Mind – Brain for global participation

The Model's lessons of using identity, visibility, reliability, and other factors can be extended to the global landscape as illustrated in Figure 15.13. Hence the knowledge gamed would be shared with the full range of global IMMs

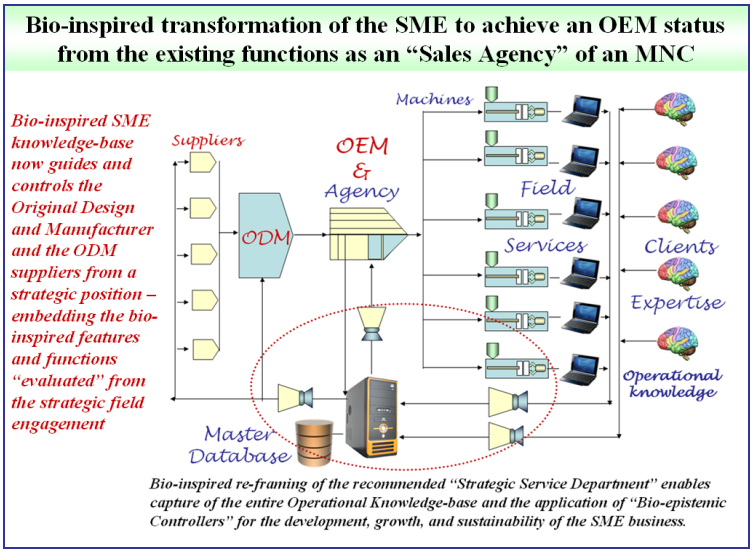


Figure 15.13 – SME opportunity to benefit from transformed Machine – Minds

Figure 15.12 and 15.13 also illustrate the practical benefits of the Model to SMEs. The strategic and commercial value from the application of the Model can be better appreciated when they are compared with their Pre-model "conventional or Pre-2000 classical" approach. Figure 15.13 for example illustrates the classical business position in which SMEs are generally required to work with Multi-National Corporations (MNC) with marginal returns at best.

The Model and its cascading benefits from just one of the epigenetic factors (ie Visibility) does indeed transform the commercial-power relationships between OEM-MNCs Figure 15.13 illustrates the transformed positions they can aspire. Agreements with MNCs generally limit the landscape for SME strategy making, confining the SME efforts to sales of the OEM products.

15.7.9 Sustainability Solutions from the new genome – Mind – Brain transplantation

The lessons from the Model therefore relate to the gaining and transforming operational data into usable innovative advisory product – services.

SMEs using these lessons can extend them beyond new machines sold. Each year less than 10% of the total machine – fleet of IMMs is replaced. This means that SMEs can expand their clients and simultaneously secure prized positions to determine when existing machines are due for replacement.

15.7.10 Global applicability of the Bio- inspired Model

SMEs adopting the lessons of the Model can upgrade their commercial status from just being sales – service agents. They can become partners of global OEMs for technology development. This is the new agenda that can be achieved with relative ease. The technologies of the internet and the web can elevate the local knowledge of SMEs to become of value to global OEMs.

15.8 Summary Reflecting on the Model's Practical Value to SMEs

In this section we reflect on the regime of Practical Test Criteria which has been applied on the Bio- inspired Model. We also summarize the case for SME strategy-making to learn from Nature's Managed Convergence of Epistemologies. Through their inspiration and lessons SME strategy-making will similarly be able to achieve a managed convergence of strategy – making epistemologies for eGID success.

15.8.1 Managing the convergence of epistemologies

The case has been presented that Nature manages human life's innovation, complexity, growth and collaboration through the managed convergence of its DNA (98% + 1.8%) –based epistemic systems. Epistemic Nature's convergence management of its landscape is almost infinite in scale. Over 100 Trillion cells are in the human life from with over 100 Billion being Brain/ neuron cell that in turn dynamically manage in excess of $1 Trillion synaptic connections – representations of behaviours.

The simplified lessons for SME strategy management are thus:

(i) All of the epistemologies form different segments and parts of Nature's knowledge spectrum dynamically interact with each other through convergence and connectivity

(ii) At the nano- scale end of the spectrum are the nano-scale geometric signatures that contain the molecular and cellular – resident connectivity mechanisms

(iii) At the meta-end are the wisdom component of the spectrum – much more easily observed by fMRI and EEG technologies

(iv) In between the 2 extremes are the data information and knowledge representations comprising bio-chemical signals and content in the form of proteins markers, genes etc

(v) Nature's development and transactional activities involve different portions of the entire spectrum managed by epistemic catalyst present in the 98% DNA. Once called Dark DNA and Junk DNA in the Pre-2000 era, their functioning are being exposed by the Post-2000 science of epigenetics.

(vi) Those epigenetic catalysts are responsible for the epigenetic managed convergence of epistemologies in Nature. They dynamically utilize the convergence mechanism of tagging, mixing, matching, silencing, validating, transforming, recycling, integrating, sequencing, and terminating Nature's building blocks. Nature's work of innovation with creative destruction results from the embedding of the epigenetic factors in the 1.8% genes of the DNA molecule.

(vii) This Project has offered a portfolio of neuro – nouns or action words from the lexicon of the English language that have their specific neuronal signatures. These conditions of state have been directly attributed to wisdom and knowledge. MRI brain scans confirm their active role in the managed convergence of epistemic and cognitive behaviour.

(viii) Further the Project has offered a Model of framework within which the lexion's correlates (of Nature's Bio-epistemic catalysts) can similarly be used to innovate by the creative destruction of the 100 years of Pre-2000 strategy-making epistemologies

(ix) The validity of the Model's and its lexicon – based catalysts are being increasingly supported by Post-2000 systems Biology and the science of Epigentics and its prolific research findings an stimuli – Mind – Brain Behavior fulfilment.

(x) With its scientific grounding being beyond question, the lessons from..... empower, SME strategy making to take immediate inspiration from the managed convergence of epistemologies.

(xi) The case for a new paradigm exists also because from a psychological and biological viewpoint, all strategy-making is nothing other them the sensory/ emotional/ vocal/ visible/ or physical representations of biochemical reactions taking place in the human life form. And what goes for the human life from (and its Mind – Brain, its cognition, and communication systems, etc) also goes for its minituarised subject of strategy-makin activities.

(xii) Importantly the DNA, molecular, cellular and proteomic proof of the validity of the Bio-inspired Model is further confirmed by the scientific proof of several concepts of the psychology of the Mind.

fMRI brain scans from numerous Research Institutes and universities confirm the scientific and neurobiological validity of concepts such as Theory of Mind,

Ascent Routine, Mirror Neurons, Reward Systems, Attribution Theory, and Associate Thinking

(xiii) The strategic integration of the lessons of psychology of the Mind, with the scientific proof of epigentics and Brain chemistry provides the Neurobiological proof and platform for managed convergence of epistemologies in strategy-making.

(xiv) The practical validity of the Model and its lexicon of epistemic catalysts are further confirmed by the paradigm shifts taking place in the scientific fields of Tissue Engineering, Regenerative Medicine and Cancer treatment.

The dominant lesson for Post-2000 strategy-making is the need for a paradigm shift that embraces the active use of the lexicon's correlates of wisdom and knowledge.

With this approach a new landscape emergences for SME involvement in Post-2000 eGID.

15.8.2 New Business Models

With the Bio-inspired model, the scope for growth and business development is no longer circumscribed or limited by the market's need for replacement machines and or spare parts. In addition, its Pre-2000 forms the business model suffers from limitations as a result of the global competition and the proliferation of agents. Such outfits become agents of convenience and can be appointed to sell product into local markets such as Australia, In several cases the Agents of Convenience may limit themselves with single one-off sales with prices that reflect the opportunistic price taking approach that may appear relevant at that particular time for the overseas based OEM. The net result is the adverse conditions imposed on the class of SME firms who choose to adopt a much longer term approach with commitment to quality, risk, service, delivery, and relationship building. Profit margins have to be pruned with nor scope or resources being set-aside for development and expansion of the business.

15.8.3 New strategic focus Bio-inspired strategy-making addresses the globality challenges with a neurobiological based focus on :

(i) Challenges to the Bio-inspirational Model
(ii) Adapting the ideas of others- beyond the simplistic approach of imitation
(iii) Localizing and benefitting from diversity in local needs
(iv) Build local leadership
(v) Pinpointing local needs
(vi) Balancing local and global demands
(vii) Leveraging global resources & looking beyond immediate organizational and geographic boundaries
(viii) Servicing the Business-to-Business (B2B) markets
(ix) Rapid learning curve development

15.8.4 Practical Test methodology confirms scope for the Renaissance of Business Strategy-making

Resulting from the testing conducted on the Conceptual, Perception and Practical levels; it is now clear that there is a neurobiological basis for all human cognition – including business strategy making with the Bio-inspiration paradigm at the practical level.

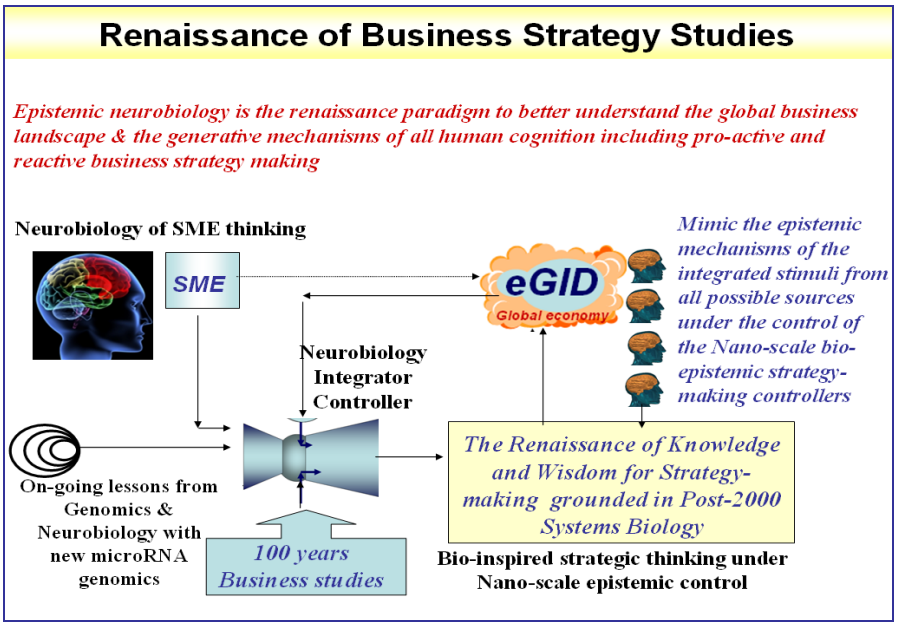


Figure 15.14 – Renaissance confirmation from Practical Testing

Figure 15.14 illustrates that the business of strategy-making is essentially the neurobiology of thought and cognition. The acceptance of the scientific basis delivers the renaissance required for new approaches to understanding the global economy and the required strategy-making epistemologies.

15.8.5 The Neurobiology of Practical strategy-making

The first step requires the capturing the Intuition of the Past that is embedded within Product innovations. In his book "The Mind of the Strategist: The art of Japanese business" Kenichi Ohmae (1982) has argued that it is the mind and the intuition of the founders of Japanese firms that have generated and facilitated the prolific range of strategic innovations that have characterized Japanese product innovations and business success. Direct lessons can be generated from Ohmae's research findings by transposing them into a neurobiological context at the practical level. Essentially therefore the innovations within products and services are the combinations of the embedded mind-sets of Pre-2000 OEM successes and Post-2000 End-user local knowledge.

From a neurobiological context therefore, the opportunity is to use the embedded mindsets and the innovative thinking of the new end-users together with the neural circuitry of the hundreds of

mind-sets that have created the Pre-2000 product and its on-going successes. The neurobiology concept provides the common platform for the epistemic exchange that SMEs need to achieve.

15.8.6 Outcomes from Practical Testing

The dominant outcome is the neurobiology of the Business strategy-making which involves the reframing of the SME business model Both machines and personnel become the containers of specialist knowledge and information. In the case of plant and equipment, the machines are embedded with the expert knowledge of the designers and inventors. Their knowledge and digitally encrypted execution codes for different scenarios are embedded within their Pre-2000 ePROMs and ROMs resident on their electronic circuit boards. The machine performs to this system of controls in conjunction with the operator interfaces and the Pre-2000 knowledge-base.

The Machine operators and owners of the "knowledge embedded" machines possess a further level of knowledge and information, in scheduling the operation and sequencing and operational parameters of the different machines, for different times and working condition and contexts.

From an epistemic viewpoint, the new unit of knowledge of Analysis for strategy-making is the combined knowledge of the Post-2000 operator and the embedded Pre-2000 knowledge within the machine system.

Access to such knowledge is therefore a key strategy-making resource. The hundreds of hours of operational performance of the machine functioning under the control of the embedded programs is a valuable knowledge-base with data, information, knowledge and functional performance under the range of scenarios established and programmed by the operator.

15.8.7 Epistemic Catalysis with 98% DNA

Access to the knowledge of the mindsets of the owner-operator of the machines and the embedded Pre-2000 knowledge within the machines are best catalysed with the Bio-Model's Functional Elements.

The highest value is obtainable from the triple combination of the three ecologies of knowledge - providing a map of the total operational landscape for which strategy-making can be developed for Post-2000 business successes.

A unique opportunity presents itself if such an epistemic position can be obtained from the creative destruction of the triple knowledge-base involving the mind-sets of both man and machine. The establishment of such an epistemic position is now possible at relatively low cost with the availability of post-2000 digital technologies, internet connectivity, and ongoing lessons from Neurobiology, as illustrated in Figure 15.15.

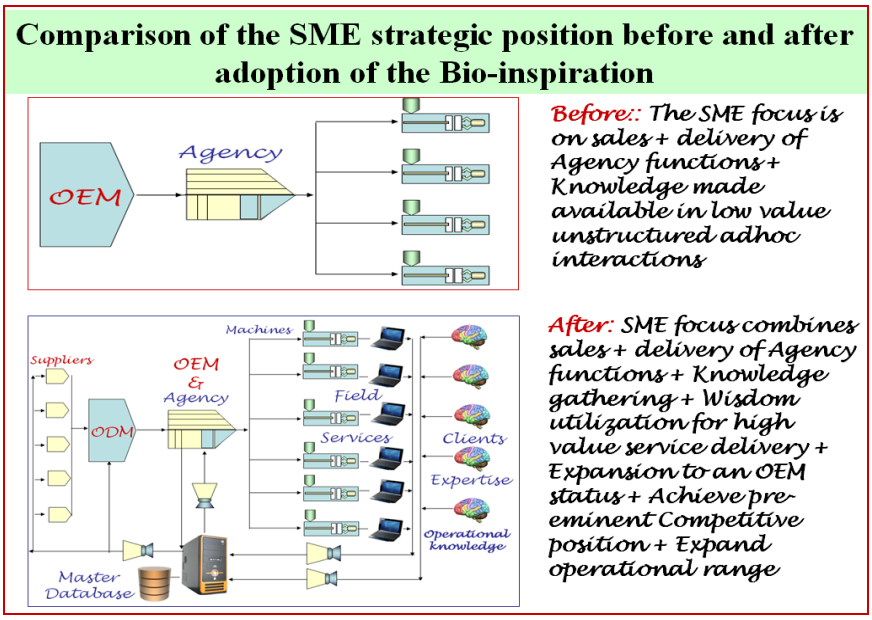


Figure 15.15 – Embedding End-user insights the Minds Machines

15.9 Chapter Conclusion

This Chapter concludes the testing regime against which the Bio-inspired Model has been successfully validated.

The Model and its functional exemplars have been found to both satisfy the scientific testing and also offer a new paradigm shift.

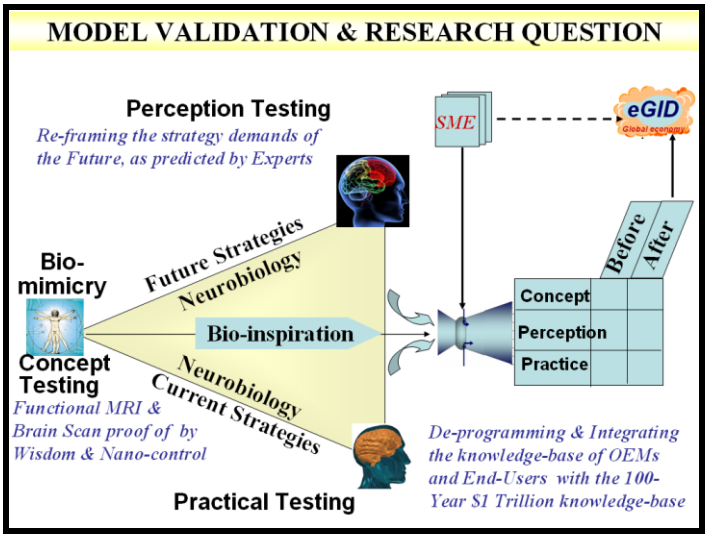


Figure 15.16 – New Paradigm emergence from Testing regime

Figure 15.16 illustrates the manner in which the testing criteria can actually contribute to the further development and practical use of the Model. Effectively the new Bio-inspired Model has ascended into the status of a new paradigm shift in thinking.

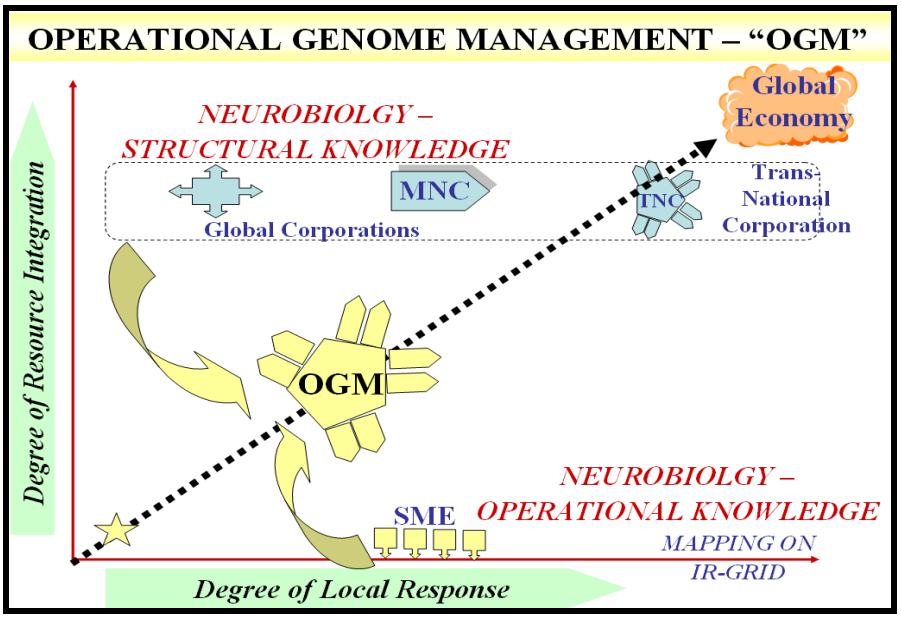


Figure 15.17 – Born-Global with New Paradigm

Figure 15.17 illustrates the new status of the Model as the new organisational Genome of the Mind (OGM) that can bring about the Renaissance of SME strategy making. A direct epistemic pathway has effectively been created, similar to the concept of "Born Globals".

SMEs needing to use the Model and its potential for achieving a paradigm shift in the contributions and success of its ecosystem could utilize the methodologies illustrated in Figure 15.18.

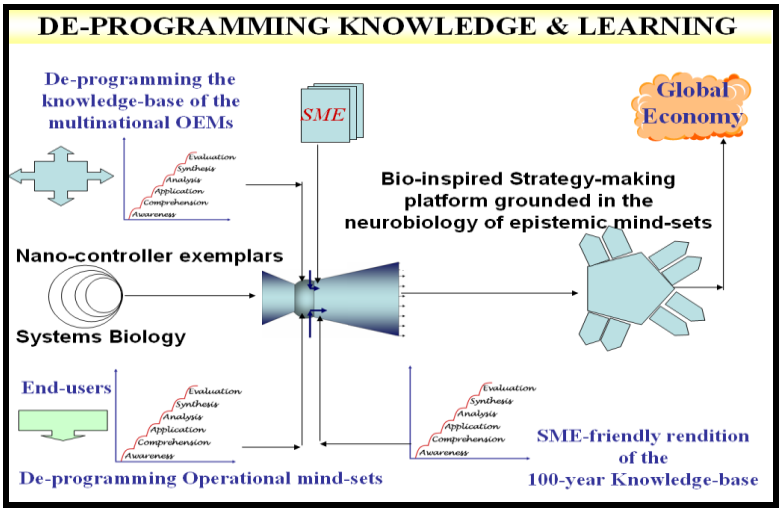


Figure 15.18 – New Paradigm that integrates scientific domains

The Figure illustrates the dynamics of the Model's managed convergence of epistemologies from the multiple sources and lessons from systems Biology, Neurobiology, Cognitive Psychology and Mind – Brain – Behavioral studies.

It is from this epistemic understanding and position that we are able to enter Chapter 16 and reflect on the entire Research Project.

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Chapter 16 RECAPITUALATION AND FUTURE WORK

16.0 Introduction

In this section I reflect on the research that has been conducted and I summarize the epistemic issues that will need to be managed for SMEs global business success. While the PhD project offers a new approach to addressing the integration of knowledge on a holistic level, my thesis however has strived to maintain its focus on the epistemic context of the SME organised business ecosystem. Their problems are the problems addressed by my research in Chapter 3 to 9. These are real problems that need to be resolved if the SME sector is to be sustainable and deliver the expectations of all of its stakeholders. It is in this context that I have researched the manner in which contributions from the four epistemic domains from Academia Technology and the Knowledge Management and Innovation Management proponents can be integrated. To this end the concept of Bio-inspiration and its extension to epistemic ecosystems has been developed. A Bio-inspired Model has been created together with a portfolio of epistemic catalysts. Together they have been successfully tested. It offers potential for the Managed convergence of epistemologies relevant to Pre-2000 and Post-2000 strategy-making resources. The summary of my Research, its achievements and the contributions made by my thesis in the process of researching and developing the bio-inspirational framework are now outlined. This Chapter concludes the Research Project – however a range of issues and further research work have been identified if SMEs are to benefit from the Project's new Paradigm shift.

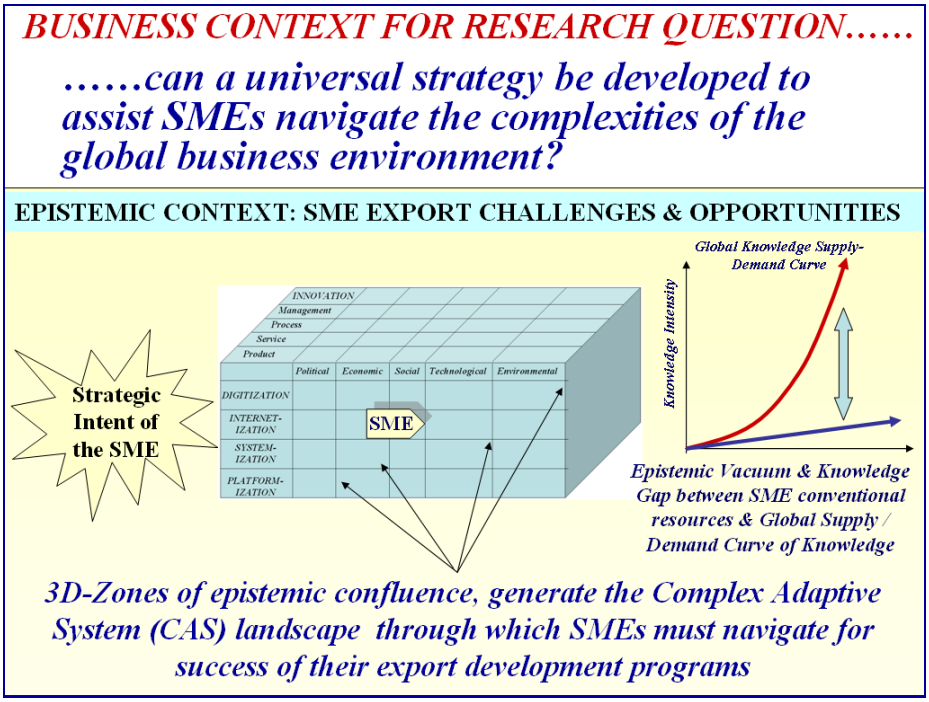

Figure 16.1 – Managing the Knowledge Gap Dynamics

The Thesis outlines the epistemic journey that sought to respond to the Research Question of whether an epistemic exemplar could be developed that would universally assist SMEs and their business ecosystem with strategy-making. In the process, we transformed the basis of the Research Question from short-sighted industry and business context into an epistemic context. From the epistemic viewpoint and platform it was possible to identify the greatest exemplar of all –ie the epistemic system used by the Mind to manage the neuroplasticity capacity of the brain. This in turn has offered lessons on the manner in which Nature manages Knowledge and Wisdom.

Reflections on the SME challenges:

The Research Project made an early finding that the continuation of the epistemic status quo was not sustainable. The combination of the dynamics of the macro – economic PESTE forces and the emerging global eGIDomains imposes a significant demand for new knowledge from the SME.

By contrast the net supply of knowledge resources available to the SME is in a stable of relative decline. Figure 16.1 illustrates the dynamics of the supply – demand curve and the challenges posed by the macro – economic PESTE forces and the eGID landscape. The Project recognized the need for SMEs to navigate the dynamics (centre of diagram) and arrest the expanding "knowledge gap" (left of the diagram).
The increasing knowledge gap is of critical importance to the Research Project SME knowledge – base is subject to a range of lifestyle, motivating removal and technical obsolescence factors.

Based on these challenges, the Research Project at its early stage sought to create a Model for SME use that would address the SME specific knowledge gap.

Structural challenge on knowledge utilization:

It was recognized however that the creation of any SME-dedicated Model would require a SME dedicated knowledge – base. This could not be achieved largely because almost all of the existing knowledge-base has been created by and for the multi-national corporation. Figure 16.2 illustrates the challenge, when the respective positions of the MNC and the SME are plotted on the Praholad Integration – Local Response landscape (I-R Grid). MNC's are in the (5,5) location seeking to succedd in the eGID (10, 10) coordinate. SMEs however are at the (1,1) coordinate.

If SMEs are to go from (1,1) to (10,10) and if there is no (SME) dedicated knowledge – base to achieve the Ascent Routines – then the Research option of a dedicated SME Model would have to be abandoned. This was the early position reached by the Research Project. It enforced the need for SME strategy-making to rely upon the 100 years of available knowledge even though it was created for the MNC. In this context, Figure 16.3 illustrates the Project challenge where SME strategy-making is forced to use 100 years of MNC-related knowledge resources. Post-2000 Information in industry press is also skewed in favour of the MNC and the "Information Tsunami" similarly posses difficulties for SME strategy-making.

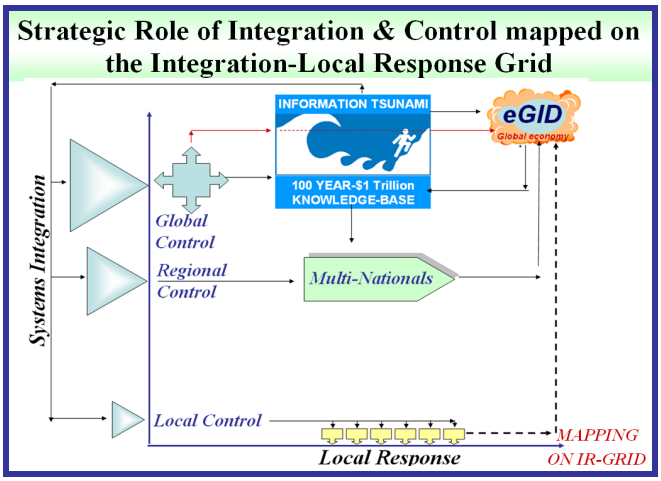

Figure 16.2 – Strategy-making structural barriers faced by SMEs.

What the PhD research is about:

Societies and Government leaders have recognized the need for SME engagement with globalization as a pre-condition for sustainable local economic development. And yet there is a mismatch between the expectations and the SME capacity to deliver.

The PhD Project is about recognizing that SMEs need a Mindset or a methodology of thinking, which would enable them to participate in the global economy despite the lack of dedicated strategy – making resources. Building – blocks created almost exclusively for MNC use have to be transformed, re-configured and rendered reusable before they can be customized to transcend the inherent barriers for SME-relevant deployment.

The PhD Research is therefore about the search for a transformation system in the form of a conceptual Model or epistemic construct that it itself needs to be usable with limited SME resources.

In its quest to develop such a system the Project has identified a transformative solution that has assisted the domains of molecular and cellular biology, cancer research, regenerative medicines and the entire world of systems biology.
Their break-out from 100 years of barrier – limiting studies is directly similar to the 100 years of business strategy – making. The PhD has sought to extract lessons from the Biology Transforming Mindsets for SME – eGID strategy-making.

Direct parallels have been created between the 2 domains. Correlates of Biology's Functional Elements/ Non Protein Coding Genes / 98% DNA/ epigenetics have developed in the form of a Lexicon of Conditions of state and Conditions of Inquiry/ Analysis/ Decision Making, etc.

The PhD Project has argued that the Function Element Lexicon equivalents doe establish convergence and connectivity of SME resources/ capabilities with the 100-year MNC-focused knowledge-base. The PhD Project thereafter developed a Model/ Methodology/ Framework in which the Lexicon Elements could be embedded within the different strategy – making building strategy – making building blocks to deliver innovation.

The PhD Project then subjected the Model and the Lexicon's catalytic and functional elements to a series of testing regimes – challenging them with the criteria of Learning, Structural Reframing, Concept – development, Perceptions of the Future and Practical – level applicability.

In each test case, the Model's superiority has been progressively confirmed. Its superiority and universality has been directly traced to its origin and source – ie the Mind. The PhD Project has effectively explored and presented an perspective on how Nature manages its knowledge and wisdom in the human – life form.

The Mind – generated scope and scale for SME utilizability of the Model and its catalytic transforming exemplars has presented a unique platform for SME – eGID success. A "Renaissance" in SME – strategy-making has been delivered.

The framing of a meta-strategy that is inspired by the manner in which natures manages its strategy development processes. The PhD researches the need for a meta strategy and then based on bi-inspirational guidance, it develops a framework for the framing of a meta-strategy that could be utilized by SMEs. The meta-strategy is a generic framing of the strategic perspectives that will need to be taken into account for the individual SME to participate in the emerging Global Industry Development sector or eGID.

The epistemic lessons available from Nature in its management of knowledge and wisdom are grounded in the DNA-RNA genomics and more importantly in the molecular and cellular biology of its functional elements. Underpinning all of the innovations and the richness of human life and its life-form stages is the information system managed by nature's functional elements and their direct representations in behavioural dynamics.

In essence Nature manages knowledge by sequencing the order and the length and the timing of the expression of four (4) information molecules – the A,G, T, and C molecules of the 3.4 billion bit long DNA. Genes that hold the code for the creation of proteins are characterized by their respective sequences and lengths of the AGTC sequences to make up information bits that can on average be 2000-4000 bits.

The control of the timing and the integrity of the gene expression is similarly produced with the DNA-RNA information molecules, called microRNA. They interact with the genes that are about to be involved with the protein creation process and they can disrupt this specific protein process or other processes producing the support proteins necessary.

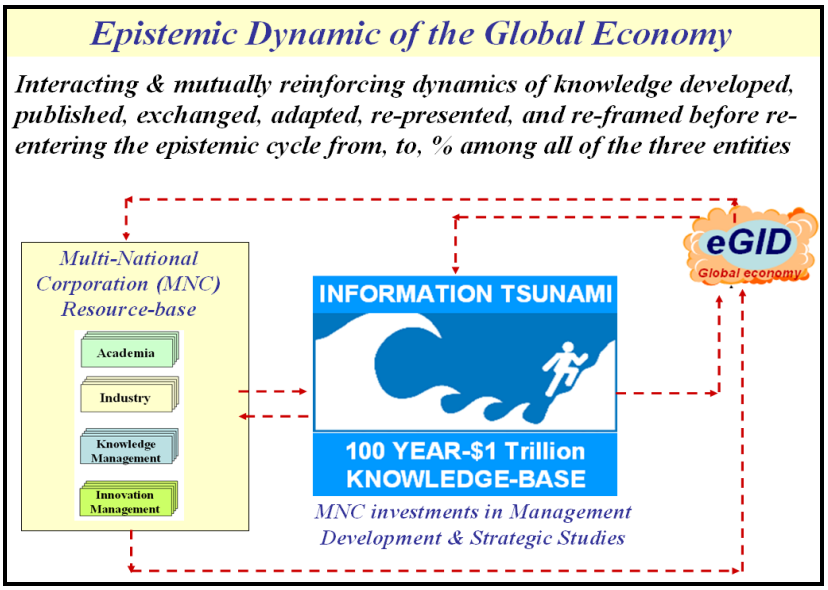

Figure 16.3 – Reusing MNC resources for the SME epistemic context

What the PhD research is not

This is not a Medical Research Project. It has however required research in the inter – disciplined areas and the extraction of epistemic lessons from Epigenetics, 98% DNA, Molecular and Cellular Biology, Tissue Engineering, stem cell research, etc.

The overwhelming evidence from their study has been the Managed Convergence of their Epistemologies. Without going into their physiological, pathological, neurological, or therapic details, we have been able to extract their convergence management lessons. The Model and its Lexical catalyzing functional element have sought to implement the convergence management system in similar fashion to Nature's knowledge Management system.

16.1 Summary of the Research

The Project has focused on developing a Mindset/ methodology to overcome structural and epistemic barriers currently limiting SME success in the global economy. In this context an epistemic system of Functional Parallels has been created that is grounded on lesson – extraction from the Epigenetic 98% DNA information/ knowledge/ wisdom Management System utilized by Nature.

The Project has offered a framework to establish connectivity with Nature's Knowledge/ Wisdom Management, for the benefit of SME strategy – making. The dominant lesson from the Business – Biology connectivity is the Managed Convergence of Epistemologies. The Research Project has over the 15 Chapters sought to develop strong Academic/ Technology – based grounding for the application of the Bio – inspired connectivity and the convergence of epistemologies.
The key concept involving the Project Research has always remained relatively simple but challenging. The dominant challenge required the development of a strategic Mindset or Model framework that would empower SMEs with Post-2000 relevant strategy-making capabilities. In

this context theoretical Model together with a portfolio of lexical catalysts have been researched and developed.

Research associated with the Mindset Model has included its testing against a full range of criteria. The testing has uncovered a range of additional epistemic insights and perspectives that have enriched the Research findings and its long term potential.
This section outlines the Research activities that generated these Research outcomes. The sub-domains include research on:

(i) SME epistemic position
(ii) Emerging Global Industry Domain relevant to SME Post-2000 engagement
(iii) 100-year – Resource – base available for SME strategy-making
(iv) Barriers preventing this utilization
(v) Lessons in innovation from systems Biology
(vi) Extracting correlates of Nature's Knowledge Management System
(vii) Development of the Model with the Portfolio of correlates of Mind – transforming elements
(viii) Operationalizing the Bio-inspired Model
(ix) Testing regime conducted on Model
(x) Sustainability of the Model and its future potential

16.1.1 SME Epistemic Position

The Research investigated the published expectations of governments around the world relating to SME participation in the Post-2000 ear of globalization. Academic researchers and government reports and declarations have highlighted the need for SME strategy – making without being able to offer actual SME relevant strategy-making delivering and fulfillment systems.
Research however confirmed that significant innovations result from individuals with SME firms. By contrast the research confirms that MNC-based management is not risk-takers. They do not formalize the "skunk-works" attitude, nor do MNC – industry labs possess the agility and the speed to match the SME mindset.

16.1.2 Emerging Global Industry Domains

We have researched and defined this landscape as the natural hunting ground for SMEs in the Post-2000 era. They do not require multi-billion dollar investments in capital works, major fabrication facilities, or broad-acre development. Instead the Research highlighted the economic opportunities that could be more easily fulfilled within the landscape involving innovation and new technologies.

Using industry reports and academic publications, the Research was able to characterize this market as highly dynamic, with ever changing innovations and short product – life cycles.

In the technology generated innovation for example, the Research highlighted the use of multiple technologies within single products, and multiple products being generated from single technologies.

The Research also presented the impacts of the macro-economic PESTE forces on the emerging global sector with further demands on SME strategy-making. The Research also characterized the eGID landscape as a domain with complexity management demands.

Finally the Research and analysis on eGID confirmed the need for business ecosystem consideration if SME participation was to be successful. In this context, the Research confirmed the relevance of the Praholad Integration – Local Response (I-R Grid) and the extreme epistemic positions of SME (1,1) coordinate with the eGID (10, 10) target location. The Research was also to visualize and characterize the SME challenge as the need to remove pathway barriers preventing SME – eGID interconnection.

16.1.3. 100 year - $1 Trillion Resources

The Research evaluated the SME – eGID pathway and confirmed that the required pathway could involve using MNC – generated strategy-making resources. The Research reviewed the dominant building blocks and strategy-making Models that were created expressly for MNC – global success – over the past 100 years, and at an investment cost of $1 Trillion in the past decade.
The Research also confirmed the relative position between the MNC, SME and eGID on the i-R Grid. The differences in their relative proximity were found to be strategic importance and relevance to the Project, viz:

(i) MNCs are well resourced with their 100 year - $1 Trillion generated knowledge-base to achieve eGID interactivity
(ii) MNCs are well positioned to develop strategic partnerships and business ecosystems to achieve the required "Ascent Routines" from their (5, 5) coordinate on the IR Grid to eGID (10, 10), and
(iii) SMEs are a long away down the Integration – Response scale – from a number of strategic and operational perspectives.

16.1.4. Barriers preventing SME Reuse of MNC knowledge-base

The Research specifically investigated representative examples of business models, strategic perspectives, success stories and innovations, etc from:

(i) Academia – with their journal publications, books, and critical reviews of existing global business operations and strategies

(ii) Technology in the global industry, with examples of new products and new markets being created by technology – based firms such as Apple dominating the stock – market as the most capitalized and profit generating entities

(iii) The Knowledge Management Discipline, with its focus on utilizing the cognitive skills of "knowledge works". The Research review evaluated examples of knowledge management over the past 2300 years from the time of Aristotle, and

(iv) The Innovation Management Discipline with its focus on generating product, process and business Model innovations.

The Research review specifically evaluated the key strategies being used for innovation delivering and fulfillment in the Post – 2000 era.

The review of all of the 4 sources or domains of strategy – making constructs simply confirmed and reinforced the Research findings that SMEs would face significant barriers if they attempted to simplistically utilize the MNC resources.

The Research confirmed that their differential position on the IR-Grid automatically presented barriers of scale, scope, content, preparatory position and contexts of relevance. The 4 sources of knowledge (from Academic, Technology, Knowledge Management and Innovation Management) demanded a Meta-system that could re-frame and re-contextualise the MNC building blocks before SME customization and re-use.

The Research confirmed also that Learning – type barriers needed to be addressed in any meta-strategy. This determination was achieved by a detailed analysis of the 4 knowledge –bases against the Bloom Taxonomy of Learning, with its defined Learning Ascent Routines.

Finally the Research confirmed the need for epistemic catalysts to be made available for SME barrier – removal. In this context, the Research confirmed the theoretical value of epistemic parallels, similies, metaphors, mimicry, emulation and inspiration. The Research argued that the use of these epistemic catalysts have been of limited value for SME strategy-making- based on 3 over-riding factors.

(i) First the epistemic catalysts used in the Pre-2000 strategy-block have been disparate and widely dispersed in application and source (from multiple disciplines). Proponents of the epistemic catalysis have called upon metaphoric examples from both animate and inanimate parallels. This lack of cohesion in the supply of exemplars resulted in the need for SMEs to jump from one lesson/ exemplar source to the next without any meta-level of control

(ii) Secondly the multi-disciplined nature of the exemplar landscape demands a level of epistemic investment from SMEs. This would impose a further barrier to SME strategy-making with its resources – competing demands

(iii) Thirdly the Research found a gap in the availability of a "whole of life" exemplar, or a universal metaphor that could assist SME with the full spectrum of strategy-making from a developmental and transactional context

The Research justified the need for such a universal platform and defined a set of criteria before candidate sources could be entertained. In this context, candidates from physics, chemistry, and

agriculture etc were rejected. Simultaneously the Research identified a parallel 100 year – dissonance/ convergence epistemic exemplar candidate in Post-2000 systems Biology.

16.1.5 Lessons from Post-2000 system Biology

The Research was able to identify the existence of close parallels in the dilemma that confronted Pre-2000 systems Biology and the Project's Business strategy-making research domain. In the case of systems Biology, and using the findings of scientific research, parallels were established with genetic DNA, molecular and cellular biology and proteomics and stem cell studies. Further the Project presented the case that the science of their physical transformation was in fact the resulting behavior of an epistemic system.

The Project identified the epistemic grounding of the DNA molecule's 4 nucleotides of A, G, T and C. the language of the human life-form and all of its biological, physiological and physical transactions involved specific combinations of the epistemic code within the 4-DNA nucleotides.

The Research argued that the dominant mechanism in the DNA-based language of life was the management of convergence made possible by the spatio-temporal connections of the 4 DNA nucleotides. The innovation – rich human life form under the control of a 4-bit information – coding system was found to be the universal exemplar for strategy-making.

The Research argued that the lessons possible with a 4-bit system would significantly overwhelm the lessons available from a 0 and 1 Binary system in the IT domain. Whole of life examples of birth, development and physical activities and sub systems provided the universal exemplar. By studying Nature's management of its 4-bit knowledge system, SMEs could gain insights on how ecosystems could be developed and managed.

16.1.6 Extracting correlates from Nature's Knowledge Management System.

The Research Project extended its exploration of the DNA-generated epistemic exemplar by transferring Post-2000 findings from systems Biology. Pre-2000 understandings were limited in focus to the 1.8% DNA segment involving "Protein-coding genes". By contrast the major 98% DNA segment was irroneously neglected as "Junk or Dark DNA", until scientific research confirmed its omnipotent role in controlling all of the 1.8% DNA.

The Project Research focused on the lesson from 98% DNA and determined that its convergence mechanisms involved DNA Functional Elements. These provided lessons for strategy-making and innovation because they delivered these same functions in the human life form with nano – scale spatio-temporal connectivity between themselves all of Nature's building blocks.
The "Tipping Point" of the Research Project emerged when a range of parallels and correlates were identified between Nature's Functional Elements (in the 98% DNA) and the Project's presentation of a Lexicon of term (that described and utilized conditions of state to establish connectivity among strategy-making business building blocks.

The PhD Project research then focused on the portfolio of lexical description of such conditions of state and determined that significant value existed when they were actively used in concept development, in coalition building, in controlling mechanisms and in innovation creation.

Specifically the Research determined that the lexicon's conditions of state were technology-neutral, were applicable across multiple domains, and were the universal guidance system for convergence in business ecosystem management.

Importantly the Research had reached a Milestone in identifying the much sought-after epistemic and universal exemplar. In extricably linked with the DNA lessons were the lessons of the managed convergence of epistemologies and its applicability to the 100-year knowledge – base of strategy-making building blocks.

Further the Research determined that the MNC-natured restrictions disappeared with the embedding and active consideration of the lexicon and its catalytic role in the managed convergence of epistemologies.

16.1.7 Development of the Bio-inspired Model

The Research findings with the presentation of the catalytic lexicon enabled all Pre-2000 strategy-making building blocks and concepts to be easily re-used. Effectively a "Renaissance" had been made possible by the Research Project's Model and its composition strongly grounded on 100-year and successfully tested frameworks. Accordingly the Model was developed that enabled SMEs to accept epistemic lessons from the catalytic lexicon, that could then be utilized for inductive, destructive, and conjunctive knowledge asset creation.

The Model also offered systematic thinking for the development of innovations in transactions and in structural development contexts (such as in business ecosystems).
In almost every instance, the Project's Model and its correlates of the 98% DNA Functional Elements directly proved Joseph Schumpeter's explanation of innovation and its generation from a creative destructive process.

16.1.9 Testing Regime on the Project's Bio-inspired Model and its Catalyst portfolio

In accordance to the engineering and scientific method of testing new "Models" and "Theories", the Research Project subjected the Bio-inspired Model to a regime of testing. This included Conceptual, Perceptual and Practical testing criteria being applied.
The Research established outcomes beyond proving the Model's validity. For example the conceptual testing established the Neurobiological basis of strategy-making. The Research Project was thereby able to crossed scientific boundaries and extend the Model's proteomic-basis into the Brain's neuronal landscape.

The Model's Unit of Analysis was similarly transformed by its focus on the Mind during Perception Testing. The Project's uncovering of the relationship between strategy-making and the Neurobiology of the Mind further unleashed an opportunity landscape for innovation. This was confirmed by the Practical Testing in which the Project presented 2 case studies where the

power of the Mind, and the Model's emulation of it was able to transform SME strategy-making for innovation.

16.1.10 Sustainability and the future of the Unit of Analysis

The Research has established that the long-term sustainability of the Bio-inspired Model can be maintained by the use of the "Epistemic Bridge and Scaffold" that have been created. Direct epistemic parallels between strategy-making entities and business ecosystem membership can each symbiotically develop with the use of the Model's catalysts for managed convergence of epistemologies – across all technical disciplines, across global territories, and across all cultures.

The delivery of the sustainability facility within the Model concludes the Research Project in that the original challenge of SME-eGID participation is now made possible.

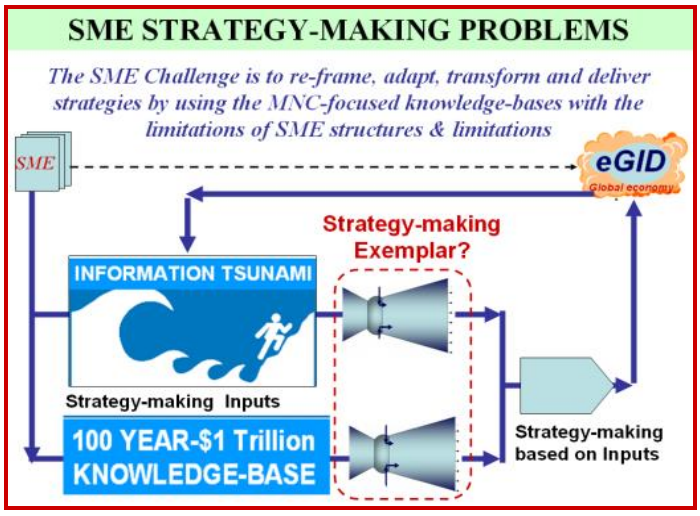

Figure 16.4 – Epistemic Catalysts for Recommendation of Knowledge

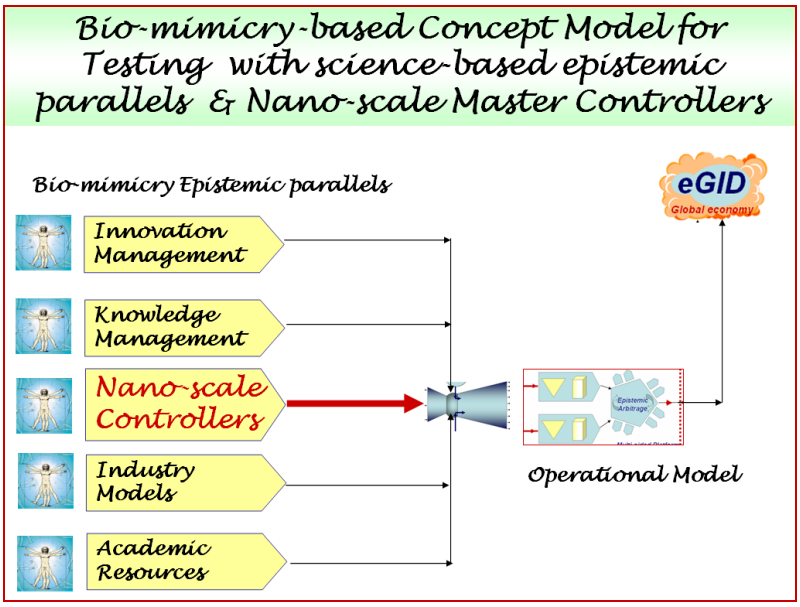

FIGURE 16.5 – RENAISSANCE IN STRATEGY-MAKING BUILDING BLOCKS

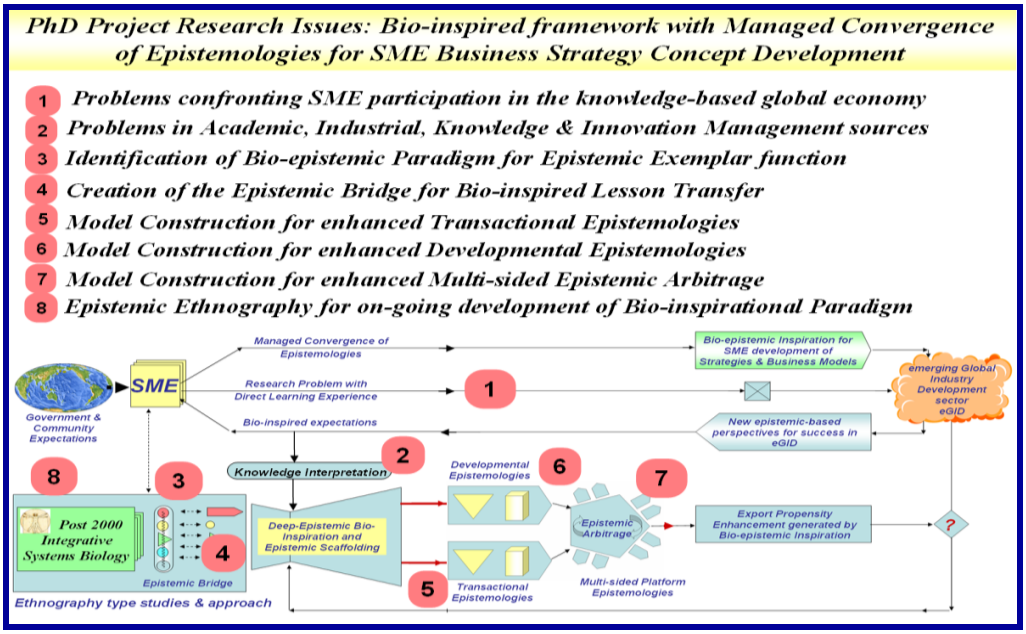

Figure 16.6 – The Bio-inspired Model in the context of Barriers

16.2 Achievement of the thesis

The challenge to develop a SME Mindset for Post-2000 strategy-making has evolved into the creation of a potential Paradigm shift in strategy-making. The Bio-inspired Model and its portfolio of epistemic catalysts have together transformed the strategic position of SMEs from one of disadvantage into one of the potential advancement and sustainability. The new Bio-inspired Paradigm has been made possible by the Thesis achievements tested in this section.

16.2.1 Development of Portfolio of Epistemic Catalyst

The Research has identified a portfolio of epistemic catalysts that offer potential to transform all strategy-making resources, irrespective of their Pre-2000 or Post-2000 status. Figure 16.4 for example illustrates the functional outcomes made possible by the embedding of the catalyst exemplars into the 100 year Pre-2000 strategy-making building blocks. As well the Post-2000 Information Tsunami can similarly be interpreted for isolation of its strategic determinants.

In both cases, the epistemic value of earlier constructs is retained as part of the required scaffold. The catalysts deliver the required "re-seeding" and re-combination for innovation and Post-2000 ecosystem development.

The direct relationship and the common source of the Catalyst and the Neurobiology of Knowledge and Wisdom further reinforced the value of the lexicon offered with the Bio-inspired Model. Joseph Schumpeter's explanation of the conditions for innovation has been justified by the strategic use of the lexical catalysts and their scientific grounding in the Neurobiology of the Mind.

The Lexical Catalysts can be used to selectively de-construct content from conditions of state, conditions of utility, value and technical legacy, etc. Chains of utility or value creation can be used with the lexical catalysts for the elimination of technical obsolescence and its replacement without damaging the epistemic scaffold.

16.6.2 Renaissance in Strategy –making Building Blocks.

Figure 16.5 illustrates the Research Projects achievement in empowering SMEs with a new functional capability. Each of the 4 legacy-based sources of knowledge and information can be harvested for potential strategy-making.

The portfolio of lexical catalysts can directly relate to valuable constructs that have previously been the presence of MNC resources. Longstanding concepts such as the Porter Value Chain, the Core Competencies of the Corporation, the Balanced Score Card etc are now more easily made usable for SMEs.

16.2.3 Development of a Customizable Model

Using the building blocks of Figure 16.5 and with the epistemic feedstock of the Catalyst – lexicon, the Project has delivered a readily customizable Model that address eGID requirements and simultaneously removes current barriers.

Figure 16.6 and 17.7 present two different contexts of the Bio-inspired Model achieved by the Thesis. In Figure 16.6, the Model is presented in the context of the Barriers that confront SME strategy-making. Within each of its elements are barriers of learning, connectivity, convergence, and obsolescence.

By contrast Figure 16.7 illustrates the scope for knowledge interpretation, for managed connectivity and convergence of epistemologies. The dominant design of the Model is its epistemic grounding in systems Biology, the power of the Mind, and the harvesting of the outcomes of the Minds of Academic researchers over the past 100 years.

16.2.4 Interpretation of Post-2000 Information Tsunami

One of the major barriers that confronted SME strategy-making was the lack of an epistemic interpretation system. SMEs lack the resources to engage specialist advisers and consultants who provide this interpretative and advisory service.

The correlates of the Mind as proposed by the Model enables SMEs to critically review and evaluate incidents, events and reported successes or failures, SMEs need not be turned away with the use of the Model's functional elements.

Dominant value propositions, or dominant features within cycles, chains, platform and technology systems are rendered transparent. Thereafter SMEs can develop constructive or competitive programs that emulate, mobilize, deploy or continue the value delivering mechanism.

16.2.5 Higher order thinking for strategy-making

SMEs are acknowledged as good product innovators, who unfortunately are not resourced sufficiently to match the product innovation with process or business model innovation. The Model offers SMEs the opportunities to deploy and engage in higher order thinking.

SMEs can utilize the Model's Catalysts as a checklist for framework to capture higher value from their product innovations with the engagement of higher order thinking. The epistemic conditions of state form part of a fairly well understood lexicon.

16.2.6. Arresting the growth of the SME knowledge gap

A key outcome of the Research Model and its catalyst – lexicon is the new capacity that can empower SMEs to better understand both their own knowledge – base as well as that of the global markets. In the assessment of the SME barriers, the Project recognized the growth of the Global Demand for knowledge relative to SME – supply dynamics.
It was argued that the differential in supply and demand created a growing knowledge gap to the detriment of the SME. With the Model, the potential exists to lower the Demand Curve and raise supply curve with the resulting reduction in the knowledge gap positively impacting on the SME.

16.2.7 Breaking out of the 1.8% DNA correlates of strategy-making

The Model's outcomes and achievements have been modeled on the achievements of Post 2000 systems Biology. Prior to this situation, genetics and related sciences were limited on the basis of their focus on the 1.8% DNA involving the "genes" (the correlates of the actual building blocks). In a similar manner, the Pre-Model paradigm for strategy-making focused on the strategy-making building blocks like the Value Chain, the legal structures of collaboration, etc. The simplistic focus and reliance on the "ends" of strategy-making obscured the rich potential for innovation by embedding the "ends" with the catalysts of innovation.

16.2.8 Bridging the Knowing Doing Gap

The Project's literature review identified the knowing-doing gap being of greater adverse impact on SMEs relative to MNCs. The capacity to transform published resources into innovation did not follow the proportional rule of automated increases in knowledge supply.
MNCs overcome this gap with the assistance of consultants. The Model and its catalyst portfolio empowers SMEs with a new capacity to bridge the "knowing-doing gap".

16.2.9 Managing of Epistemologies

A key foundational outcome of the Research is the focus on the need to manage convergence and connectivity among available epistemic resources. Innovation is generated by convergence and connectivity to the extent that new and or higher customer value propositions can result. The Model's catalytic lexicon provides the articulation systems for convergence, connectivity and continuation of value delivery systems and their fulfilment.

Systems from different technical disciplines, geographic locations and corporate domains can be unified through the epistemic articulation systems. Coupling and de-coupling can be achieved with relative ease for the creation of theoretical constructs.

16.2.10 Unification of knowledge for strategy-making

The Research Project has demonstrated that all knowledge is the portfolio of variables representation of DNA spatio-temporal expressions. Their common legacy means that all knowledge blocks can be integrated. The Project's presentation of the lexicon of catalysts can directly contribute to their functional integration.

Figure 16.8 illustrates how the Project's Model utilizes the catalysts in the Epistemic Engine with the cognitive mechanisms of inductive, deductive, constructive, integrative and expansive thinking.

Every domain with potential for strategy-making can utilize the Epistemic Engine and the Catalysts to seek out the inductive/ deductive/ constructive/ integrative innovations.

16.2.11 Epigentic basis for Model's innovation generating potential

The Research has established a direct link between strategy-making and the science of epigenetics (involving the 98% DNA activities controlling the 1.8% DNA building blocks). SMEs are now empowered with a self-knowledge system to draw parallels and lessons from how environmental stimuli can be interpreted in order to reach deliverable outcomes from the Model.

The 98% DNA- Epigenetic landscape is rich in the parallels and lessons for strategy-making for initiating, controlling, constructing, integrating and silencing the converged epistemologies. In addition the use of the Model's Catalysts is grounded on the scientific phenomena that relatively tiny DNA fragments of micro-genes (such as microRNA), methy molecules, acetyl-molecules, etc) can control heavy-claimed protein synthesis.

In a typical situation ~ 22 bit microRNAs can silence the production of Protein Coding genes contaiing 5,000 to 10,000 nucleotides. In a similar manner the Model's Epistemic Lexicon of strategy-making catalysts can control the development of innovation with macro-scale business concepts such as Value Chains, Supply Networks, etc.

16.2.12 Mobilizing Business Ecosystems with the Mind

A key deliverable from the Research is the potential to generate self-knowledge within SMEs that has facilitated in the Bio-inspired Model.

The Post-2000 business landscape is characterized by business ecosystems functioning in innovative business models such as "Multi-sided Platforms", Growth Development Platforms, self-managed Supply Chains, and Vendor Managed Turn-key systems, etc.

The Model's delivery of a self-knowledge enabling capacity provides SMEs with the Epistemic Scaffold to conceptualize future ecosystem formations and to then utilize the catalysts in the mobilization and recruitment messages.

Chains of integrity, visibility, mobility management, with agility, etc are the new lexicon and guidance charter for Post-2000 business ecosystems. The Catalytic Lexicon also appeals directly to the Minds of both Decision Makers and participants.
Figure 16.9 illustrates how the "Mind" engagement can also be extended to embedding Mindsets into machines (within ROMS and ePROM and Engine Management Systems) etc. Figure 16.9 also illustrates how Machines are being used to decode the Mind's management of stimuli, cognition and resulting behavior.

While the functional MRI (fMRI) brain scans are still in the laboratory stage of cognitive of psychological research, SMEs can directly benefit from the lessons that can be extracted from their Abstracts and Summary publications.

16.2.14 New Capacity to understand and analyse the global economy

The Research Project's goal to enable SMEs to understand the phenomena and complexity of eGID has been significantly addressed by the Model and its portfolio of catalytic connectors. The challenges of eGID can be analysed in the context of the dominant themes or dominant patterns that are contributing to market appeal and customer value proposition development.

The Model's Epistemic Engine provides the visual resources for going beyond intuition alone. The inductive/ deductive/ integrate basis of new developments and innovations can be better achieved through the structured approach offered by the Model.

16.2.15 Academic Intervention with Cognitive Psychology

Figure 16.10 illustrates the world of concepts and psychological domains that are involved with strategy-making. Although they may appear far removed from the SME, the Model has argued for SMEs to learn to manage the epistemic landscape.

The Model has also provided the tools and the epistemic basis for the managed convergence of their epistemologies. In Figure 16.10 for example the Model's structure (lower centre – right of the diagram) is involved with the mechanical/ operational processing. At the top/middle is the new Mindset offered by the Model, for SMEs to interpret the macro-economic PESTE forces, the dynamics of the global eGID landscape, and the mindsets of ecosystem partners.

The Model's deliverables include a new capacity to integrate relevant inputs from Academia, Technology, knowledge Management and Innovation Management. The dominant outcome is the new capacity offered to exercise a "Theory of Mind" for Academic Intervention and Learning.

16.2.16 Summary of Research Outcomes

The list presented is but a small representation of the actual potential from the Model, its Epistemic Engine – Structure and its Catalytic Lexicon – feedstock.

By its direct relationship to the Mind and its scientific grounding in the Neurobiology of the Mind, the Model is able to function as an Academic Intervention Tool. The Model works across all technical, business, scientific and economic domains – with the full spectrum of insights from the nano-scale level to macro-considerations. Finally the Model's dominant deliverable is the advocacy of the use of Wisdom to guide and control all learned knowledge and behavior.

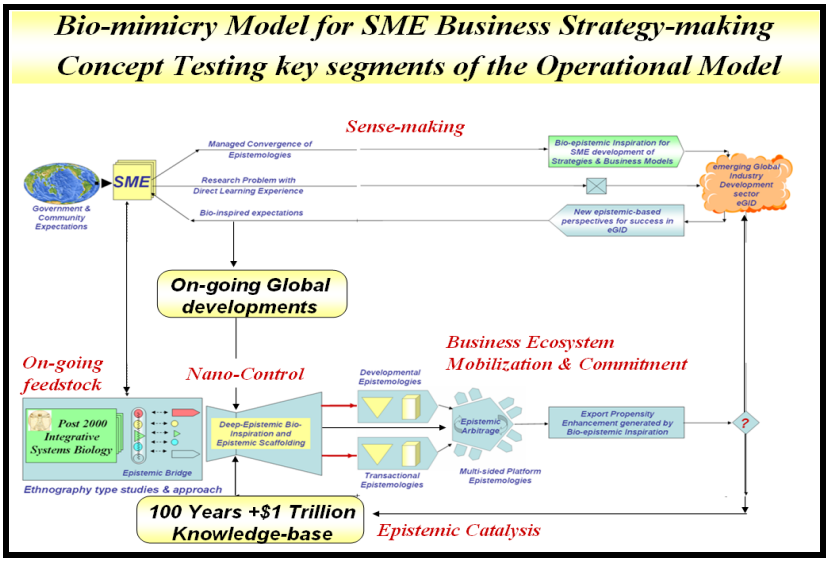

Figure 16.7 – The Bio-inspired Model in the context of Innovation

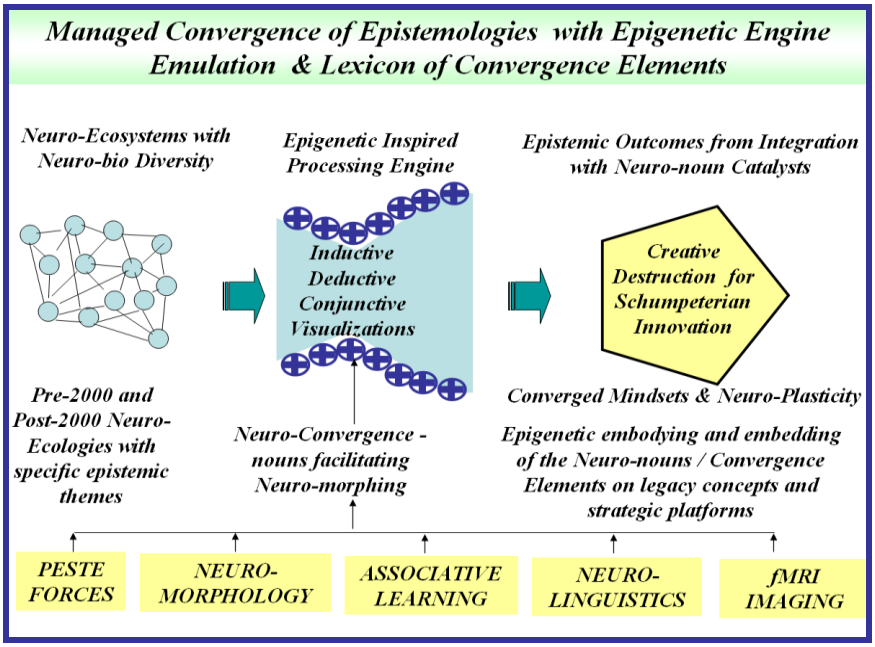

Figure 16.8 – The Lexicon of strategic thinking

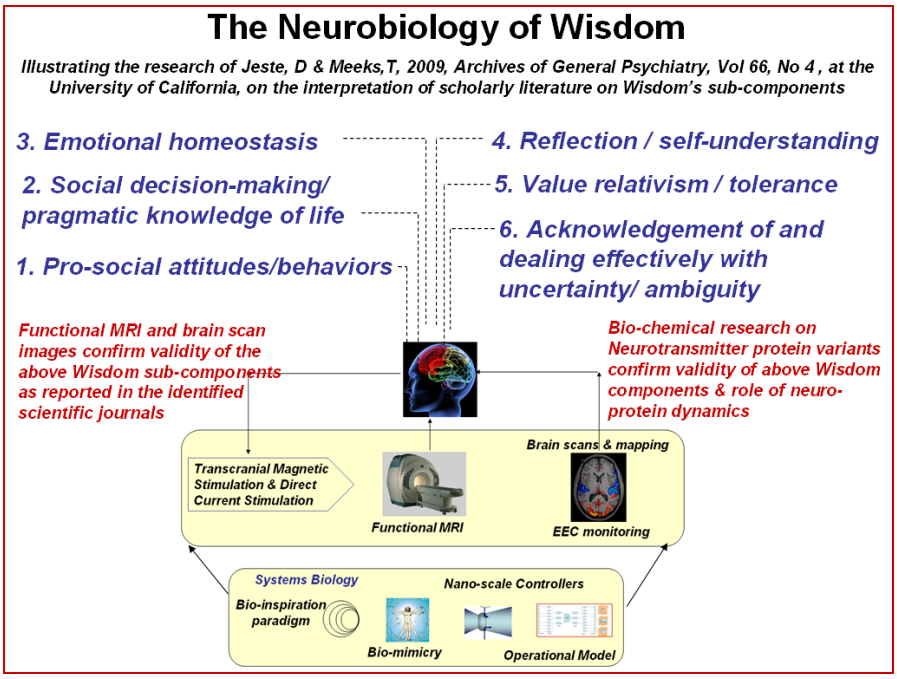

Figure 16.9 –The Bio-inspired neurobiology of Strategy-making

Academic Intervention:

In this Chapter we wish to share some of the insights resulting from the Research Project that could be of benefit strategy-making studies for SMEs and for Academic Intervention. Our Research Project has created and presented a unique perspective of the knowledge required for strategy-making that is grounded in the neurobiology of the all human thought. The concept of the neurobiology of strategy making, as a result presents a new vista of opportunities for further research and advancement of knowledge that can be of practical assistance to SMEs and research scholars. This Chapter therefore offers suggestions in which this renaissance of strategy-making knowledge can benefit from the work already conducted.

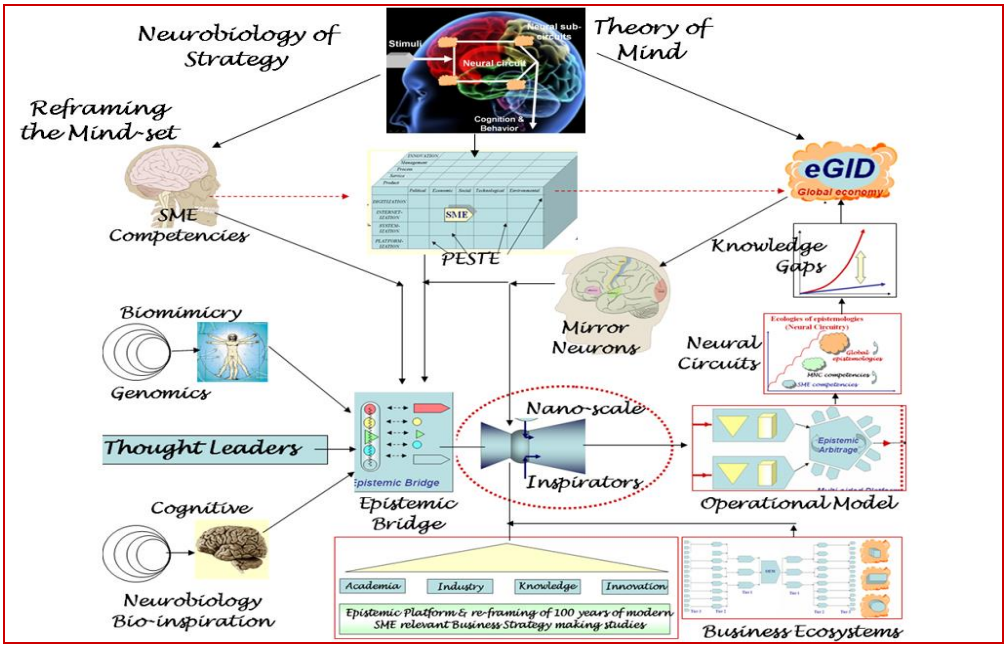

Figure 16.10 – Model's managed convergence of epistemologies

16.3 Contribution to new knowledge by the Thesis

The Research Project's contribution to new knowledge results from the active engagement and extraction of lessons from the disciplines of DNA genomics, Systems Biology, Epigenetics, Proteomics, Synthetic Biology and Regenerative Medicine, etc
Lessons from the Neurobiology of the Mind in particular and the Mind's Management of the Brain and Behavior have specifically offered potential for a new Bio-inspired Paradigm shift in SME strategy-making.

In this section we outline representative cases that justify the claim that the Model dominant contribution can be aggregated into the new paradigm being offered.

16.3.1 Managed Convergence of epistemologies

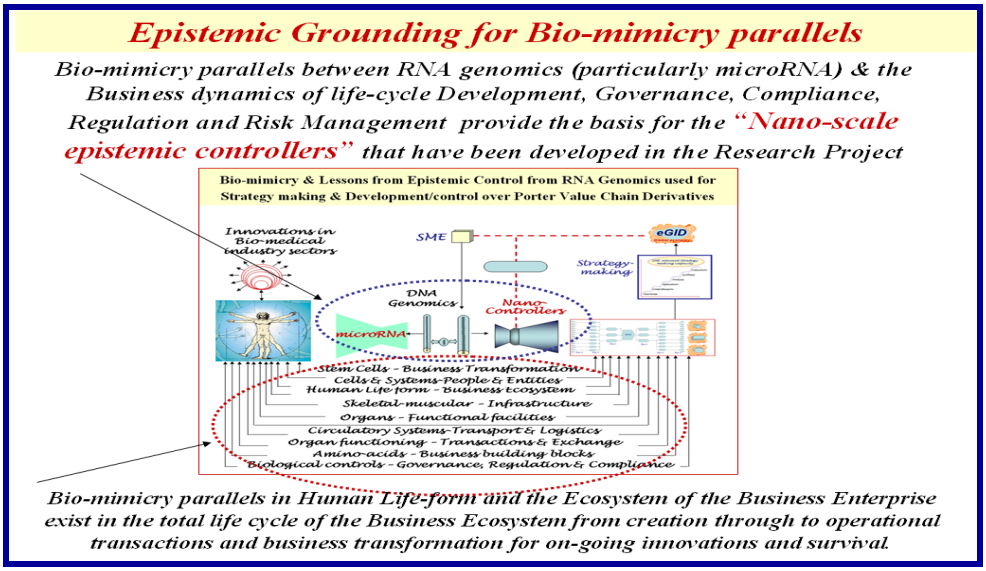

Figure 16.11 – Uncovering the potential for a new Paradigm

This thesis present my journey that has resulted in the development of the new paradigm grounded on the neurobiology of strategy-making studies. Potential for an illustration of Figure 16.11 that explain:

(i) the extent of the epistemic business landscape of the global economy within which SMEs must integrate

(ii) the molecular and cellular genomic concepts within Post-2000 Systems Biology which can provide the epistemic exemplar and lessons for SME learning in business strategy-making

(iii) the development of the bio-inspirational Model and the manner in which the Operational Model becomes unique with the integration of the Research Project's Nano-scale bio-epistemic Controllers

(iv) the testing landscape for Conceptual, Perception and Practical testing of the Model and its Controllers, and

(v) the development of the Research Project's recommendations for the future in the nature of Academic Intervention for SME relevant strategy-making.

Each of these sections represents a different cognitive domain, but yet they are all grounded on the common DNA information system.

16.3.2 Deconstructing with the new Paradigm

The problem and the dilemma confronting SME participation in the global economy is the lack of an epistemic conversion system or a catalyst through which this significant knowledge-base can be put to strategic use by SMEs. The problem is compounded by the fact that the investment and development of this knowledge-base has largely been focused on the needs of Multi-National Corporations (MNCs). The knowledge-base has been funded, analyzed, adapted and reported upon in the context of such Multi-National Corporations (MNCs). Essentially this knowledge-base is not in a ready-to-use format for SMEs. The "100 year-$1 Trillion knowledge-base" has to be deconstructed and de-contextualized before the necessary adaptation to transcend the limitations that characterize the SME resource-base in knowledge and managerial expertise and experience.

The new paradigm is grounded in the deepest epistemic levels of mental thought and cognitive behavior. It has only by delving into the nano-scale levels of molecular and cellular biology that an epistemic basis has been created for the required epistemic catalysis of the MNC-knowledge base. Direct epistemic parallels have been created as an epistemic exchange and transfer system in order to develop the required re-framing and the transformation of the MNC-designed knowledge-base.

16.3.3 Redefinition of strategy-making with Neurobiology and the Managed Convergence of epistemologies

According to the Nobel 2000 Laureate Professor Eric Kandel, most neuroscientists agree that most of our mental life is unconscious and words and images are the only manner in which these otherwise inaccessible brain processes can be brought to the conscious state. The new paradigm leverages this faculty with the new lexicon for knowledge and wisdom.

The aggregation of multiple cognitive domains as illustrated in Figure 16.12 assists SMEs to recall and maintain a continued mental image of the epistemic dynamics and to continually make multiple discipline crossings.

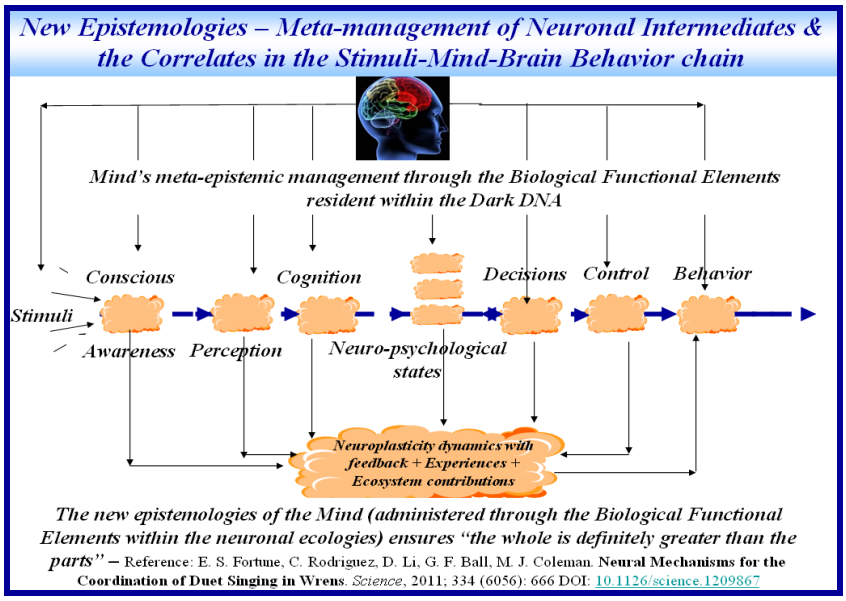

Figure 16.12 – The New Paradigm's re-definition of strategy-making

16.3.4 New Paradigm Ascent Routines

Professor Richard Restak visualizations of the of the future as the future of Neurosocieties directly supports the New Paradigm and its Ascent Routines that can be used by SMEs.

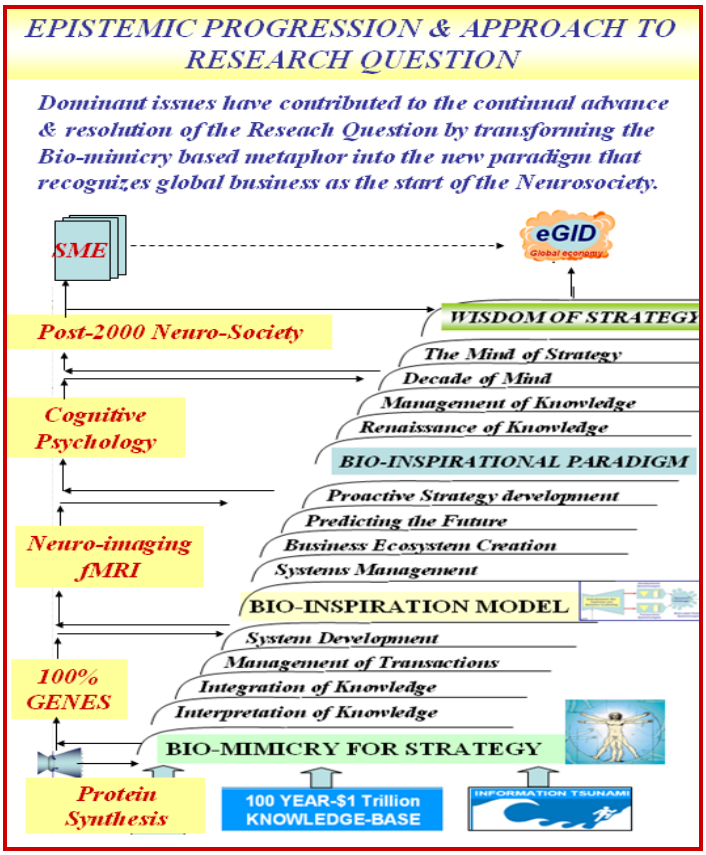

Figure 16.13 – Ascent Routines with the new Paradigm

Figure 16.13 also illustrates the epistemic progression of the Research Project in the context of the new Paradigm being offered. It traces the epistemic advancement from the stage in which lessons from the Epistemic Management of the SME strategy-making Protein Synthesis System are utilized as the platform to reduce the complexity of the knowledge-base that SMES require for strategy making. The complexities of the emerging Global Industry Development (eGID) sector are compounded by the complexities of the 100-year - $1 Trillion knowledge-base (because of their original design, context and funding to satisfy the needs of Multi-National Corporations). The same out-of-context situation and need for knowledge transformation applies to the Tsunami knowledge-base.

16.3.5 Knowledge and Wisdom aggregation

The Research has in our opinion contributed to knowledge and wisdom aggregation over the past 2300 years of Western Civilization. Figure 16.14 for example illustrates the explanations made by Aristotle the Greek philosopher.

Post-2000 Systems Biology and Neurobiology support this approach of Mind, Matter and converged Epistemologies for composite (innovative) outcomes. For SMEs not able to delve into the philosophical domain, the Model offers SMEs a short-cut to leverage Aristotelian thought making for a variety of contexts. Figure 16.5 for example illustrates the complexity of an online delivery-focused business ecosystem that could benefits with the lessons from Aristotle.

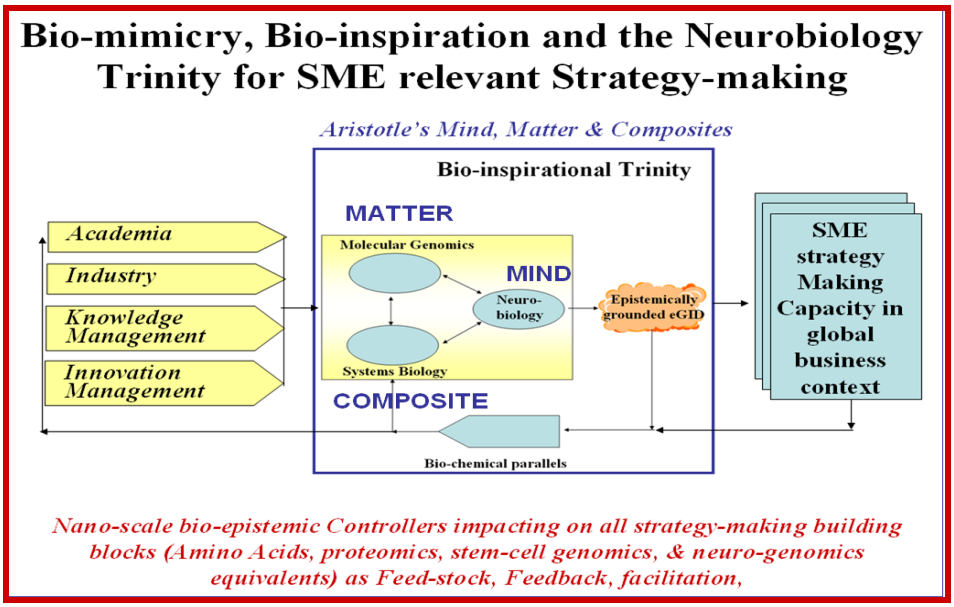

Figure 16.14 –The Bio-inspired neurobiology of Strategy-making

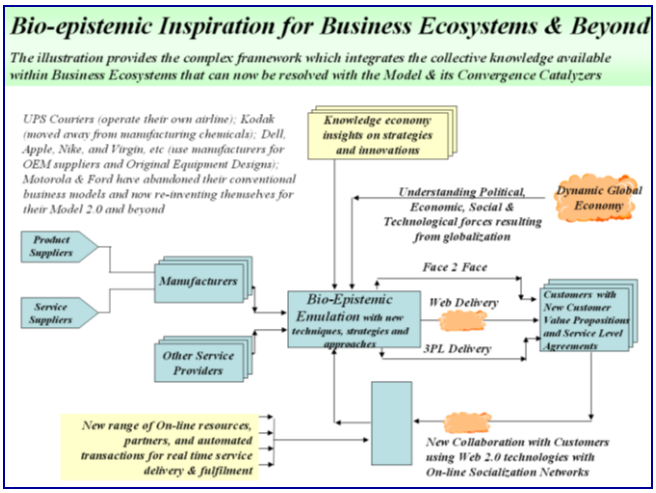

Figure 16.15 – Paradigm based unification for ecosystems

16.3.6 New Paradigm for Academic Intervention

In this section we present a representative contributions to new knowledge made available by the Model which supports the justification of the scope for a new bio-inspired paradigm for SME-strategy-making. Figure 16.16 illustrates the new landscape for Academic Intervention with the Bio-inspired Paradigm and its focus on the new unit of Analysis. This involves the application of the Model's Catalytic lexicon to function within ecosystem within and across interdisciplines. Navigating this landscape would not be possible without the Model.

New Paradigm Perspective on Toyota Production System

Figure 16.17 illustrates how the Mind and the Model's Mind – shaping catalysts can achieved the world-best outcomes of the Toyota Production System (TPS). Over the past 2 decades, the TPS has been acknowledged as difficult to emulate. And yet its 4 foundational elements involve 4 concepts of the Model's catalyst Lexicon. Toyota stresses the need for learning to support:

(i) Visibility
(ii) Variety
(iii)Variability, and
(iv)Velocity

By contrast the Model offers a portfolio that is grounded in the language of the Mind. Wisdom and knowledge have been found by fMRI studies to incorporate the catalysts of integrity, identity, managing ambiguity, etc. Academic intervention is now being offered a new dimension for SME progress.

New Paradigm with the Boisot I-space

The Neurobiology of the Boisot I-space, as illustrated in Figure 16.18 and Figure 16.19 demonstrate the value of the Model and its Bio-inspired paradigm shift. The main limiting constraint of the Boisot I-space has been the challenge to "Abstract" or conceptualize intellectual constructs (for the Z-scale on the Boisot Prism). With the new paradigm, the Model's Epistemic Catalysts are indeed the closet representations to the required "Abstractions". Populating the

Ispace (2-scale) with the epistemic conditions of state (ie the Abstract mindsets of the Model) will reposition SMEs to the optimum launch point for innovation (Figure 16.18).

In a similar way, the decline in the supply curve of SME knowledge can be arrested and reversed (per Figure 16.19) with the embedding of the Model's epistemic/ catalyst lexicon.

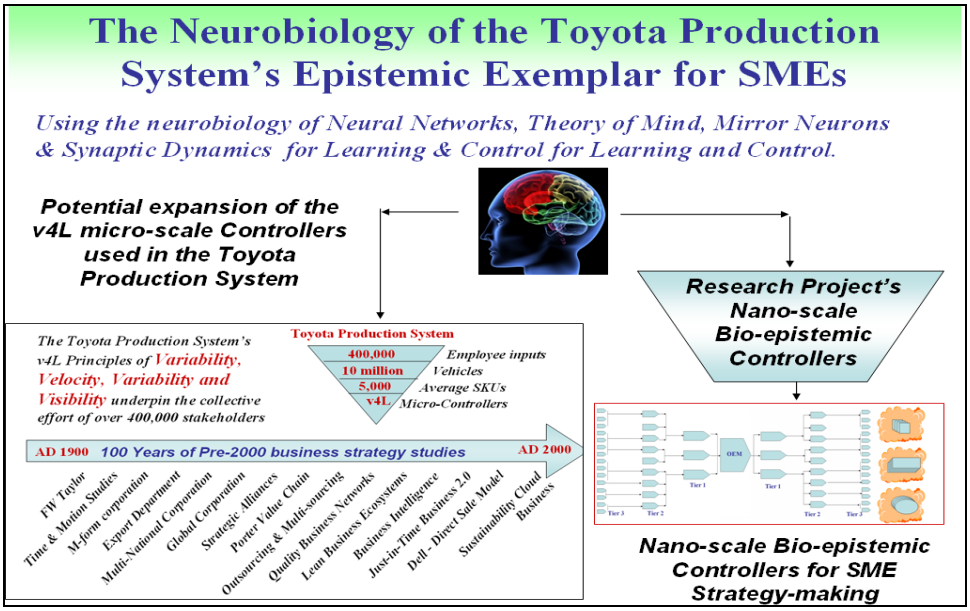

Figure 16.17 – New Paradigm context of the Toyota Production system

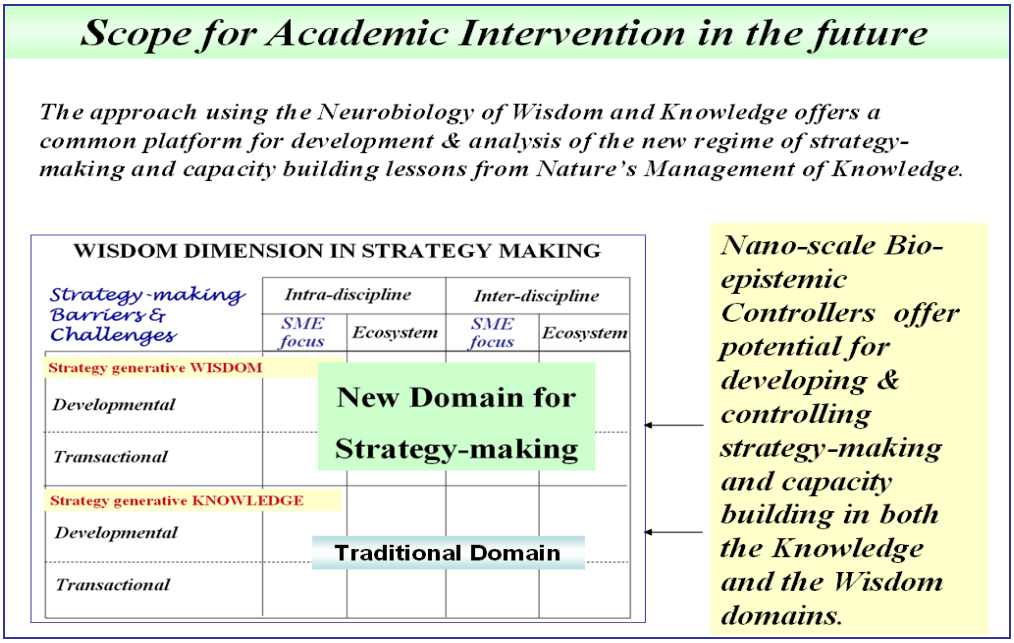

Figure 16.18 –The Bio-inspired neurobiology of Strategy-making for Academia

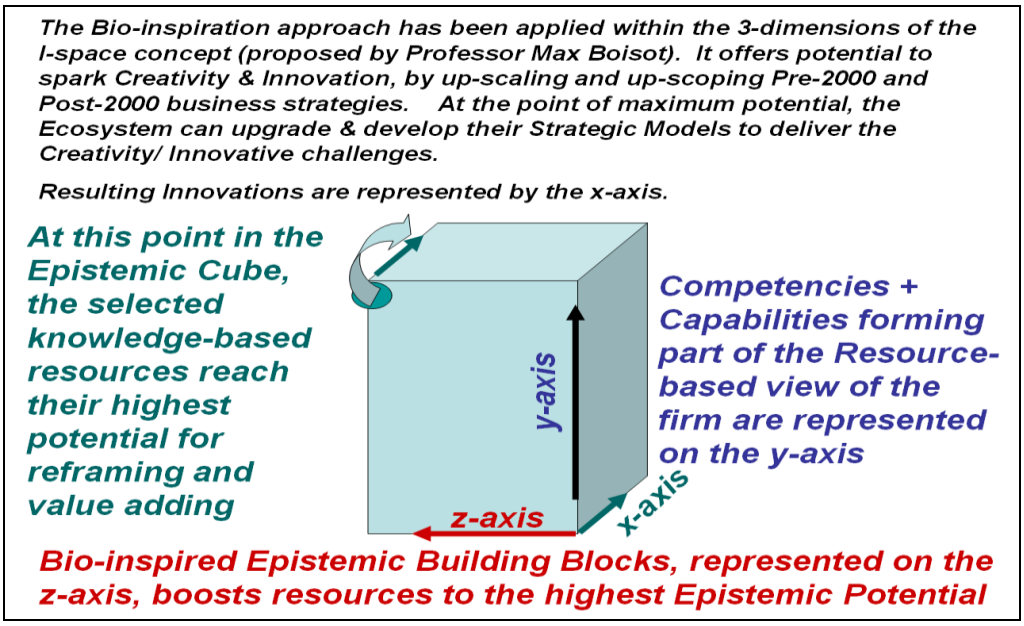

Figure 16.18 – The Neurobiology of the Boisot I-space

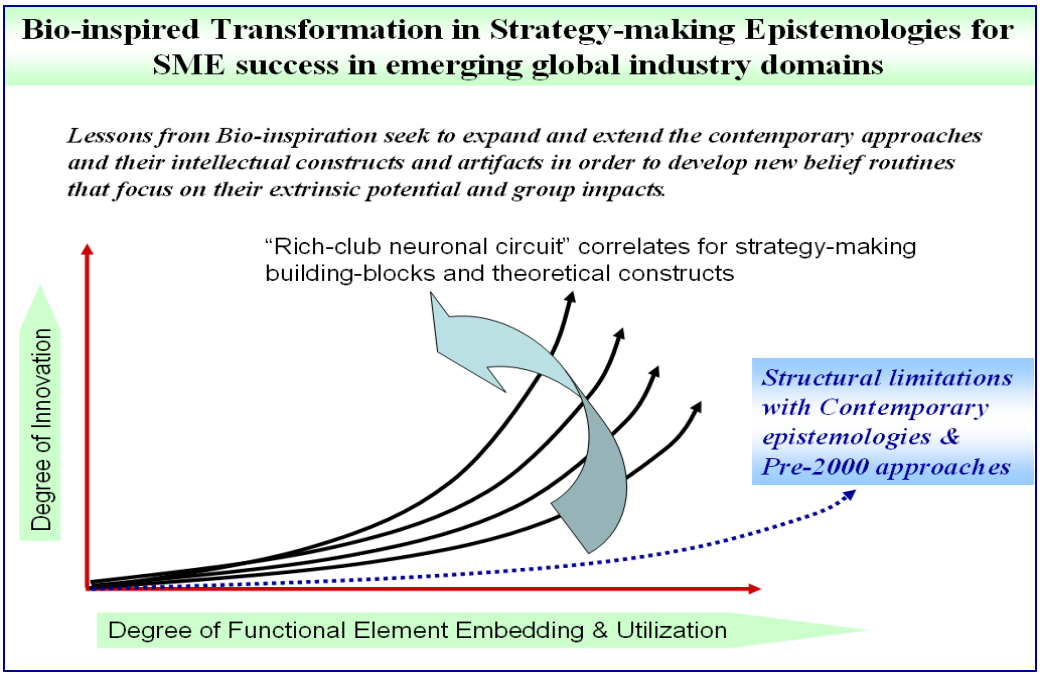

Figure 16.19 – Arresting the decline in SME Knowledge Supply Curve

The New Paradigm with Theory of Mind

The power and value of the new Bio-inspired Paradigm (a direct contribution from the Model) is best obtained from the Theory of Mind concept – application). The Model and its Epistemic Catalyst portfolio enable SMEs to deploy this psychological framework to achieve understanding and collaboration from ecosystem members and potential clients.

Figure 16.20 illustrates the new knowledge creating facility made available by the Bio-inspired Paradigm that provides SMEs with a new platform and Mindset to examine how strategy-making can be advanced in a collaborative manner.

The Neurobiology of Mindsets are also required to understand the phenomena of the Global landscape and the prolific delivery of innovations (that need to be mated by using the Bio-inspired Model). The Bio-inspired Paradigm "Theory of Mind" also empowers SMEs to be bold and cross into multiple disciplines outside of their traditional zones of experience.

As illustrated in Figure 16.21, SMEs can apply the Model and its Catalysts to evaluate products, services, processes and business models from the Theory of Mind vantage point. The Theory of Mind concept is also being grounded in scientific research with fMRI studies. Even though such research is at its scientific infancy, the lessons available for SME strategy-making are ready to use.

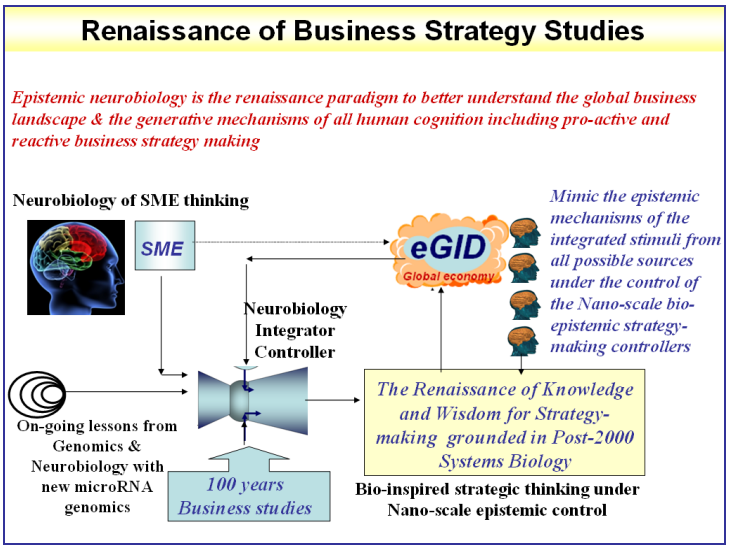

Figure 16.20 – Applying Theory of Mind with new Bio-inspired Paradigm

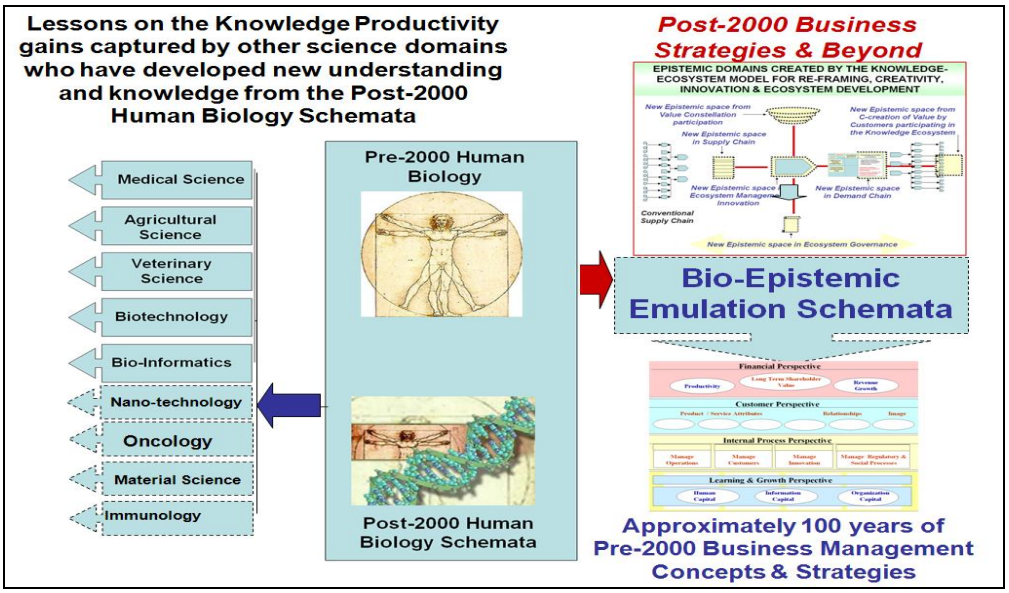

Figure 16.21 – Discipline crossing with the Bio-inspired Paradigm

Moving away from current limitations to Strategy-making learning approaches:

The Bio-inspired Paradigm with its new Theory of Mind faculties offers SMEs and Academic Intervention the opportunity to break away from adversial and decisive thinking. Figure 16.2.2 illustrates the new landscape for collaborative thinking, away from the previous epistemic approach of "silos" of discipline, and the mentalities of "divide and conquer" and of making information available only on a "need to know" basis.

The Bio-inspired Model and the Bio-inspired Paradigm are underpinned by the Pre-2000 "Appreciative Inquiry" protocols – that offers potential for ecosystem development and collaboration based on shared Mindsets. The value of the Pre-2000 motivational slogan can indeed be harvested with the Paradigm's Theory of Mind Protocols.

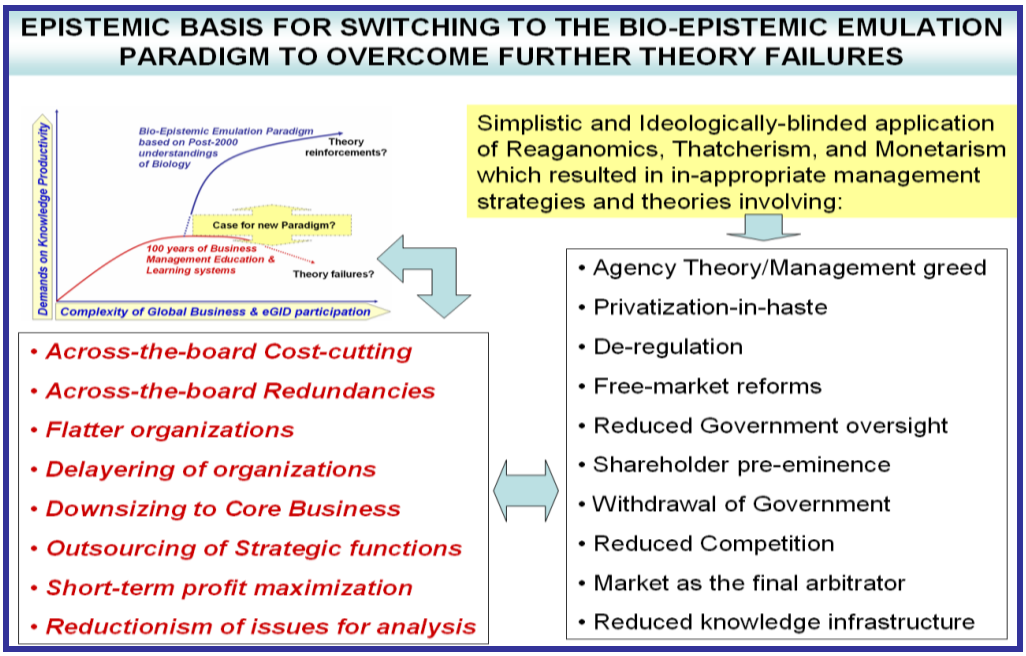

Figure 16.22 –New framing for Academic Intervention

Transformation and Trans-disciplined Paradigm

The Bio-inspired Paradigm's contribution to new knowledge extends to its transformation functions and its trans-disciplined crossing-over capacity. Both of these domains are generally to difficult from resource – limited SMEs to incorporate
into the strategy-making investments.

The net result is that SMEs are forced to remain in their IR-Grid location, with limited opportunities for global engagement. Figure 16.23 demonstrates how the Research Project has itself taken advantage of the Bio-Paradigm.

By progressively delving deeper into the SME-strategy-making challenge the Academic exercise has been transformed with trans-disciplined resources. Epistemic resources earlier considered ill-suited for SME adoption now contain the scaffolds and the customer value prepositions that matter.

In the context of lessons from stem cell research and the Induced Pluripotent stem cell findings, the new Paradigm can similarly re-program the valuable old into the newly functioning now.

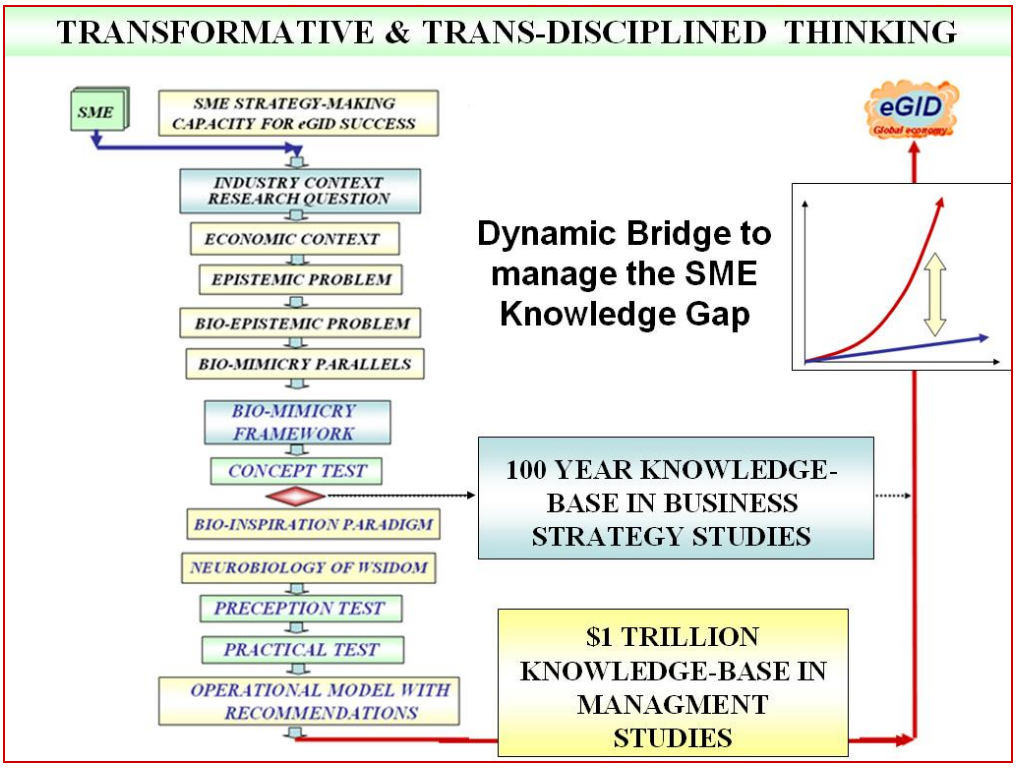

Figure 16.23 – Breaking out from the IR-Grid Ghetto

16.3.6. Summary of contributions of new knowledge

The Thesis has established the scientific basis for including SME strategy-making firmly within the preview and control of the bio-epistemic interactions that are delivered by the Human Mind. While this might appear to be self-evident, the Thesis has established the scientific basis not only as proof, but also as a resource harvesting and bridge-crossing system to the power of the Neurobiology of the Mind.

Beyond epistemic parallels (with the 1.8% DNA protein synthesis), beyond mimicry and bio-inspiration, the main contribution is the new bio-paradigm connected with the new Mindsets made possible. It is a sad fact and an unfortunate situation that legacy-based SME strategy-making did not actively engage itself with the power of the Mind.

With the linkages established by the Model and the Paradigm this deficiency has been eliminated. Everything, every thought process from the Mind, in the future will now be available as a potential contribution to new knowledge creation made usable by the Model and its catalytic lexicon.

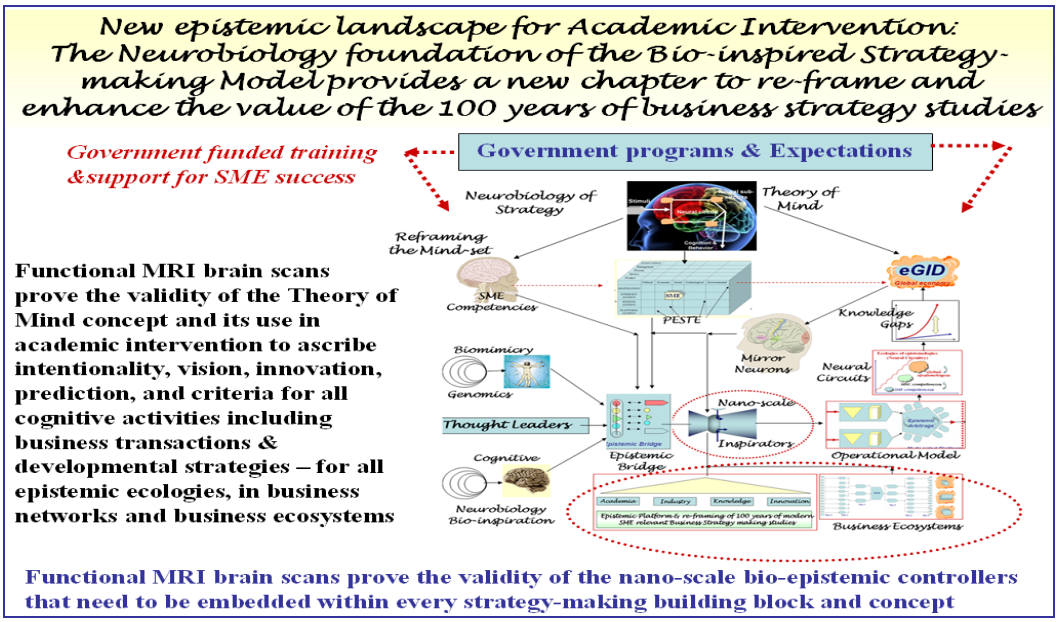

Figure 16.24 – The meta-theoretic value of the Bio-inspired paradigm

16.4 Future Work

"The kingdoms of the mind are the kingdoms of the future"- Sir Winston Churchill

The epistemic lessons for SMEs is that they have the opportunity to use the Model, its Catalyst feedstock and the Bio-Paradigm to similarly change their mindsets – previously restricted by Pre-2000 legacy-based thinking.

Applying the Mind to understand the Mind of Global business:

Figure 16.25 illustrates the need for future research with the Bio-inspired Model, its Catalysts and the Paradigm. Legacy based approaches focus on the innovations made possible by digital technologies and the ever increasing digitalization of physical activities – all being carried out on line.

Its potential for future innovation is governed by the 2^2 curve illustrated in the lower part of the drawing. Future research on the Bio-inspired Model and Paradigm would benefit SMEs to better understand the digital-innovation generating mechanism. What also needs to be researched is the over-riding causal system of the Mind that generates the knowledge and Wisdom that in turn creates the digital innovations.

Future research needs to address the Mind Curve with its 2^8 potential (based on the 4 bit code of the DNA). Research needs to also go beyond using 2^2 scale thinking to decode 2^2 scale innovations. The Mind's superior power to decode/ reveal innovation opportunities with the 2^8 level of thinking is illustrated in the upper curve.

This (2^2-2^8) differential needs to be researched for SMEs to be able to better evaluate the global economy (because the global economy itself is the neuronal representation of the global Mind in aggregate).

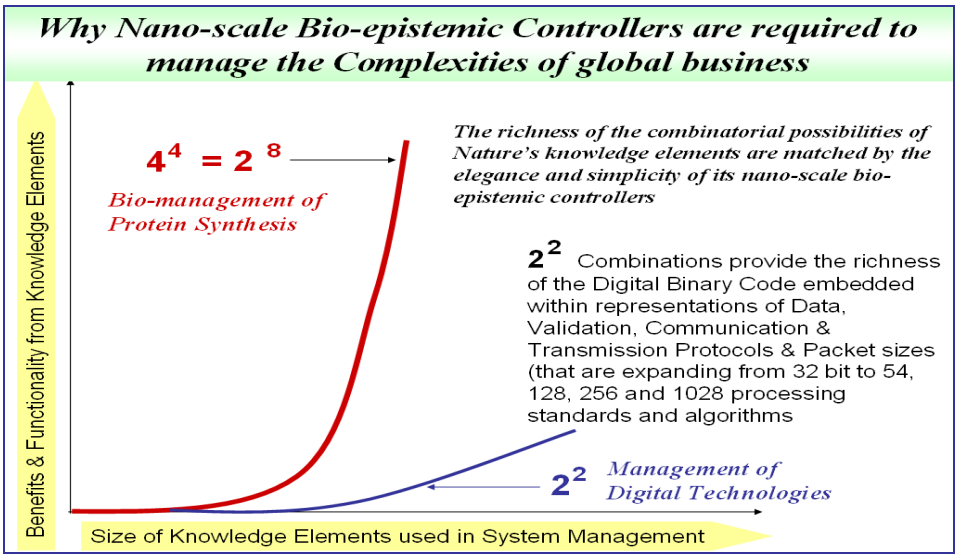

Figure 16.25 – Using the Mind to de-code/ reveal the Global Mind

Strategy of Mind:
Strategy-making with Genome Management
A key lesson from Post-2000 Systems Biology research and Bio-technology experimentation is the beneficial effects of transferring the desirable DNA from a not so elegant organism into a desired cell-embodiment system (but which contains a not-so-elegant DNA). DNA swapping offers the potential to utilize Nature's Infrastructure Management System lessons.

Research needs to be conducted on how similar "Mind" swapping can be achieved for SME strategy-making.

The DNA swapping lesson is effectively an example of the "Under New Management" metaphor, and it is this new metaphor that can be used for SME strategy-making with the bio-inspired Mind.

Research on the Neurobiology of Buiness.

We commenced the Project in the context that Governments around the world are keen to see their local SMEs prosper. A key support system that such governments can provide is funding for research on the Mindsets of global players. Their Mind – Brain – Behavior chains are creating the complexities of the Global business ecosystem.

Figure 16.26 and 16.27 offer areas requiring research considerations. In Figure 16.26 we illustrate the need for research on the individual elements that characterize the emerging markets. For example research is needed on the Mindsets that are engaged in the prominence being accorded to governance, activism, social networking, global reach, and self organization, etc.

These behaviors are the result of Mind – Brain interactions and no research exists that can be directly beneficial to SME strategy-making. In Figure 16.27 we illustrate the type of further research required on the microcosym of the SME mind in its exploration of the global mind. Research at this meta level is required if the valuable scope and potential of the Bio-inspired Model and its Paradigm are to be realised.

Tracking Mind Brain Behavior (MBB) discipline being created and developed by US Universities

Harvard University are currently developing this inter-disciplined approach to dialogue and education in response to the explosion of research interest in this emerging domain of knowledge. The Harvard Society for Mind, Brain and Behavior promotes multi-disciplined dialogue and barrier removal (http://www.hcs.harvard.edu/~hsmbb/) with programs being implemented in the fields of neurobiology, psychology, philosophy, computer science, history of science, human evolutionary biology, and linguistics. The scientific foundation for the MBB research is the capacity to innovatively utilize Funcational MRI (fMRI) brain scans and to synchronize them with planned experimental activities that test different hypothesis.

While the MBB paradigm and its fMRI scans offer direct support for the Bio-inspired Neurobiology paradigm for business strategy-making, parallel research needs to be conducted in order gain insights and perspectives for the development, extension and integration of the MBB concept to business strategy making and business capacity development.

The key issue needs to be on the role of the nano-controller equivalents in both disciplines – for biology and for business. The role of nano-scale microRNA equivalents in the genomics of the brain are yet to be fully explored and exposed. At the current time, the limitations of fMRI resolutions are unable to track the in-vivo functioning of the microRNA as it impacts on the neural circuits and sub-circuits for visualization, cognition, memory recall, validation, and the inner experiences of the mind. Once these fMRI limitations are overcome with super-sensitive hardware and technologies, as it must happen indeed, the knowledge-developmental gates will be fully open for MBB to become a further resource for the neurobiology of Bio-inspired strategy-making. The Bio-inspired of nano-scale control and its correlates with the management of the Mind therefore need to become mainstream areas for future research.

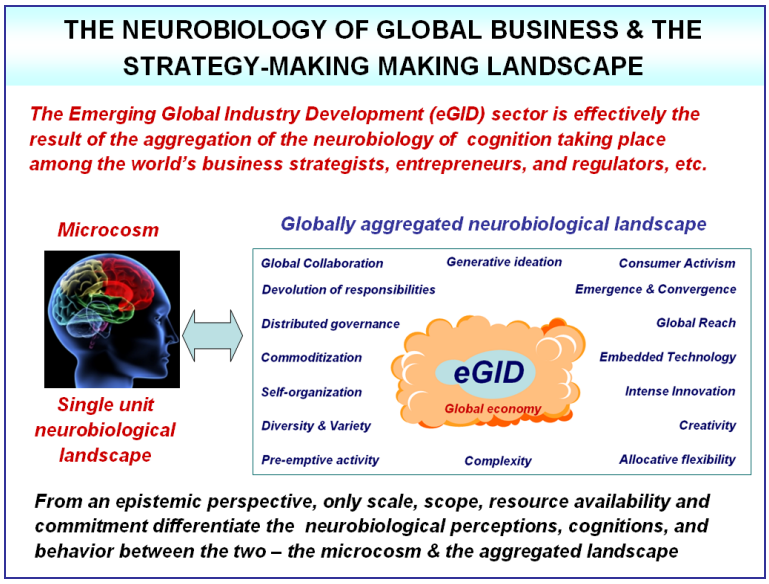

Figure 16.26 – The Neurobiology of the Global Mind

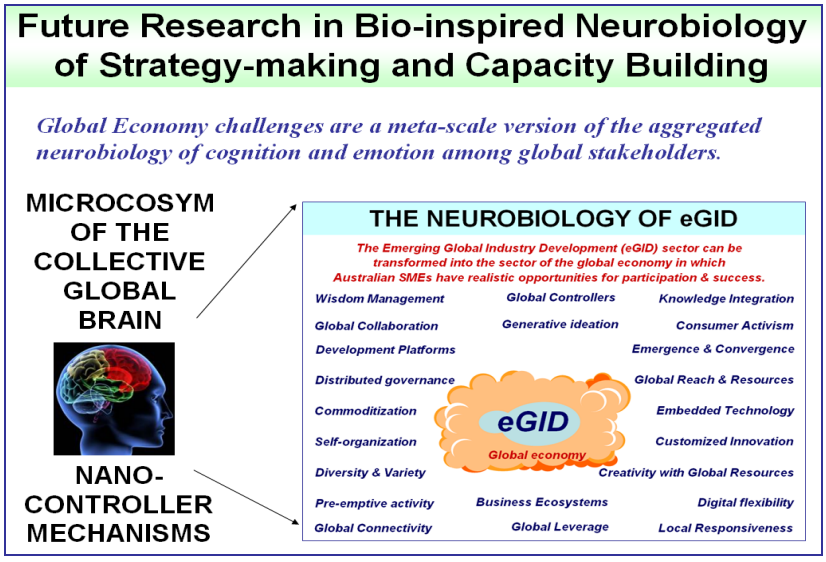

FIGURE 16.27 – MINDING THE MIND OF GLOBAL BUSINESS

16.5 The Vision – Bio-inspired Neurosociety

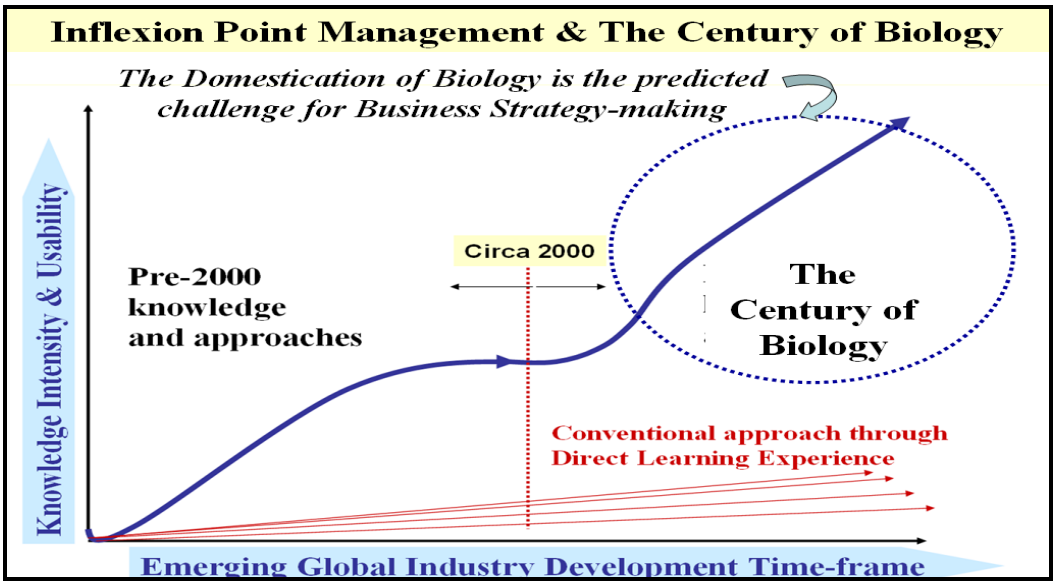

Figure 16.28 – The new century for SME strategy-making renaissance

We wish to share some of the insights resulting from the Research Project that could benefit strategy-making studies for SMEs and for Academic Intervention. Our Research Project has created and presented a unique perspective of the knowledge required for strategy-making that is grounded in the neurobiology of all human thought. The concept of the neurobiology of strategy making, as a result presents a new vista of opportunities for further research and advancement of knowledge that can be of practical assistance to SMEs and research scholars. This Chapter therefore offers suggestions in which this renaissance of strategy-making knowledge can benefit from the work already conducted.

The Century of Biology

Professor Freeman Dysons prediction that the 20th Century will be the Century of Biology is being proven daily with scientific research and findings in systems Biology, DNA Genomics, Oncology, Immunology, Stem Cell research, etc.

Biology's discovery of the 98% DNA elements as the mechanism of Nature's Knowledge Management and Wisdom Management system offers the macro-economic message that can recruit SMEs to consider changing their Mindsets for bio-inspired thinking. Figure 16.28 illustrates the opportunities for a similar break-out to be achieved with resulting renaissance in SME-strategy-making and successful global engagement.

The Neurobiology of Wisdom:

The need to require wisdom elements within SME strategy-making would have generated mocking smiles or bewilderment. With the scientific basis having been established with the neurobiology for all Stimuli – Mind – Brain – Behavior there is no excuse why the Wisdom elements should be discarded, just because SMEs do not possess the funding necessary to engage the "Wisdom Management Consultants" like MNCs. Wisdom is the continuum of the Epistemic Spectrum that needs to be managed in total.

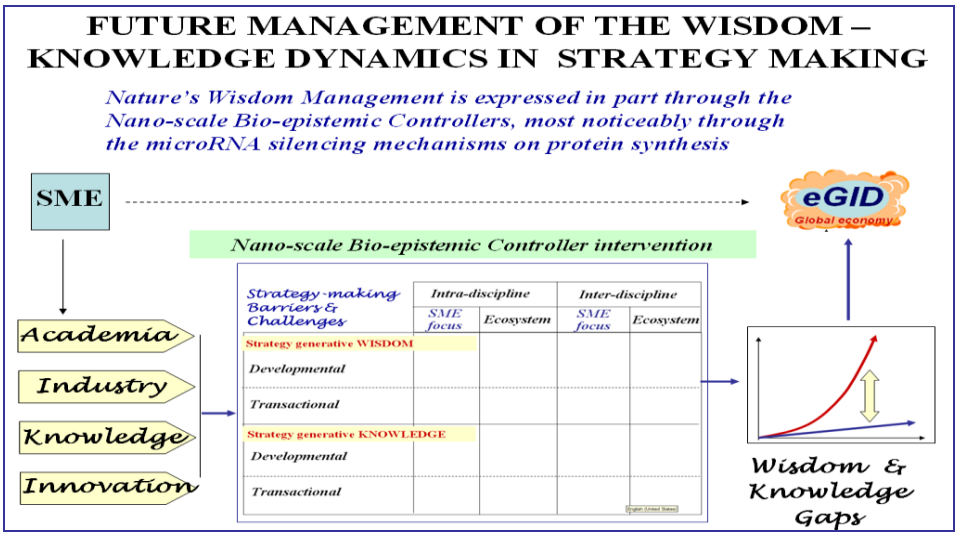

Figure 16.29 – The Neurobiology of Wisdom for Academic consideration

Figure 16.29 illustrates the Bio-inspired neurobiology of Strategy-making and the opportunities for utilizing the new Wisdom domain for strategy-making and capacity building. Scientific research linked the actions of microRNA in protein synthesis will continue to deliver lessons for the enaction of the Wisdom domain into business strategy making and capacity building.

Lessons from Optogenetics

The vision is that this new scientific domain will generate valuable lessons for SME strategy-making. This brand-new (2010) scientific discipline is offering unparalleled opportunities to study the Mind – Brain – Behavior Chain.

The field combines the technologies of Fibre Optics with Neuro-genomics. It offers future potential to track the expression and locations of specific neurons. At some stage in the future, Bio-business research may be able to test the validity of the Bio-inspired Model's Catalytic Lexicon. Until such time, the SME-strategy-making stakeholders in academia and industry need to keep track of the valuable lessons being offered to understand the workings of the Mind.

The world of Epigenetics:

The workings of the stimuli – Mind – Brain – Behavior Chain will soon be better understood from ongoing research in this brand-new scientific domain. Its focus on the 98% DNA segment directly relates to the functioning of the biological correlates of the Model's Bio-epistemic catalysts. Lessons from Epigentics will be extremely valuable to future SME strategy – making also because the impacts of environmental factors are under active research.

Stimuli in the form of project challenges, developmental or transactional requirements etc can be better understood in the confirmation that could be expected from epigenetics – that the Model's Catalysts are true representations of the epigenetic portfolio of Functional Elements, Transcription Factors, Bio-markers, microgenes, microRNA elements etc.

The Concept of Neuroeconomics, Neuromarketing and Decision-making behavior

The concept of "neuroeconomics" is a further bio-inspired approach that is similar to the the Mind-Brain-Behavior discipline. Neuroeconomics offers significant potential to both assist and benefit from the lessons of the Bio-inspired paradigm for strategy-making and the application of the nano-scale bio-epistemic controllers. Neuroeconomics studies are being conducted by leading research institutes and universities because of the recognition that all human thought – conscious and unconscious - can be directly traced to the actions of neurotransmitter proteins and their nano-scale microRNA controllers.

Attention in the early stages of Neuroeconomics is being applied tot her neurobiology of Game Theory and decision making. Other areas focus on the capacity, application and study of Neureconomics to predict behaviour, social decision-making and emotion. The studies include researching the concept of "inner-experiences" of the Mind and their extension to understanding the processes of mental valuation, learning values, and the neural mechanisms of choice.

Neurosociety, epistemic metamorphosis, and the new Bio-inspirational Paradigm

Over the past eleven Chapters of this Thesis, our Research has presented a case on the need to recognize that the emerging Global Industry Development (eGID) sector does demand a new epistemic approach and a new paradigm of conceptual thinking for successful SME participation. The epistemic metamorphosis taking place in the eGID landscape is taking place as the result of multiple drivers and influences which is typical of the conditions leading to the adoption of a new epistemic paradigm. In tracing the history and philosophy of science, renown physicist and philosopher Professor Thomas Kuhn introduced the concept of a paradigm shift. Kuhn (1970 and 1959) explains how a new approach to learning, understanding and problem solutions does come along at regular intervals in the history of science, the Paradigm shift punctuate, replace and enhance the earlier thinking and conceptual approaches.

In our opinion, the thesis has presented the case for a similar paradigm shift in SME strategy-making.

16.5 Conclusion

We believe that our Research has uncovered the proverbial tip of the iceberg – with the paradigm that links SME strategy making with the Neurobiology of the Mind – Brain and Behavior. Examples of similar Paradigm shifts that have revolutionized their industries include the replacement of Integrated circuit devices with full micro-computer systems (eg Apple) and the field of Precision Agriculture.

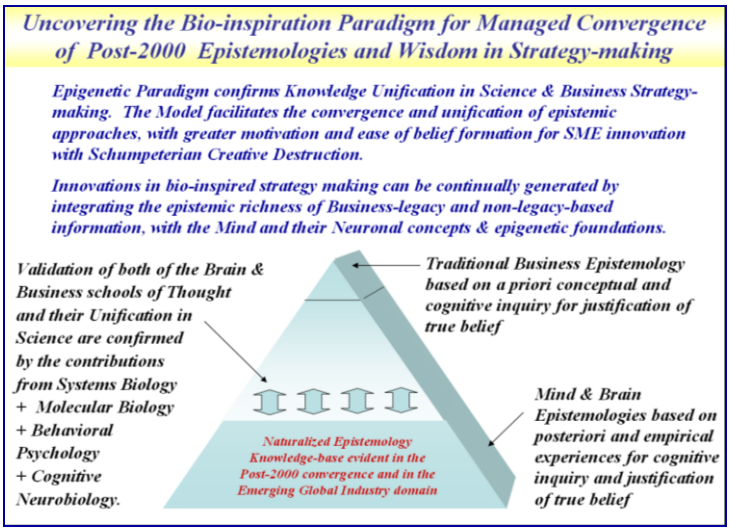

Figure 16.30 – The Tip of the Epistemic Iceberg

Precision agriculture uses the combination of Mindsets generating satellite imagery services, intelligent sensor systems, new understandings of root zone ecology and nutrient management for each of the individual parcels of land that make up the landscape. The integration of the individually customized parcels of land make up the total output of the broad acre ownership zone.

In a similar manner this Project argues the case for Precision Neurobiology of the SME Mind and Brain. Figure 16.31 and 16.32 illustrates the Ascent Routines and dynamics of the recommended Precision Neurobiology that can boost SME strategy-making. The 20th Century may belong to Biology but strategy-making belongs to the SME Mind and the managed convergence of its epistemologies.

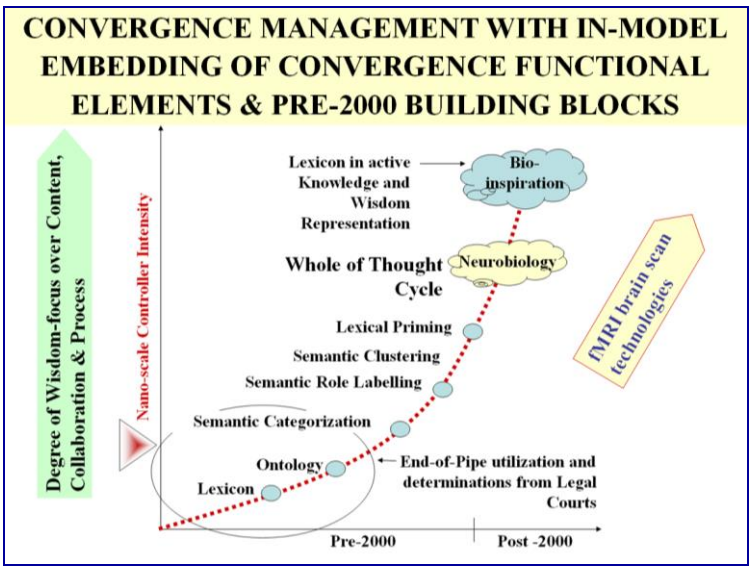

Figure 16.31 – Precision Neurobiology and the Ascent Routine

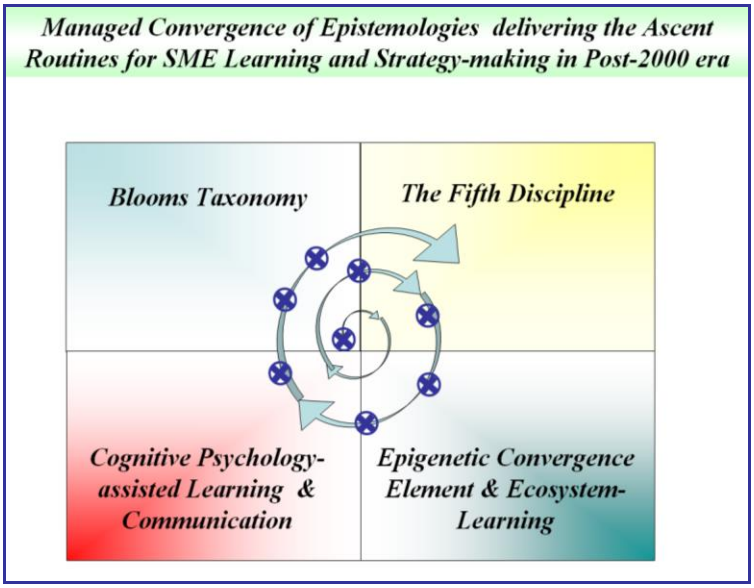

Figure 16.32 – The Neurobiology spiral of Mind – Brain - Behavior

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APPENDIX – A GUIDE TO UTILIZE THE BIO-INSPIRED MODEL FOR SME-STRATEGY MAKING

A1.0 Context: The Appendix seeks to assist utilization of the Research Model by SMEs from and across multiple industry sectors.

While the capability and usability of the Model derives from the neuro-scientific foundations and mechanisms utilized by the Human Mind, its utilization-methodologies can be implemented with relative ease.

Essentially the Model enables SMEs to follow the workings of how the Mind controls the Brain in the development and delivery of strategic thinking.

It is in this context that the portfolio of "Neuro-nouns" has been developed and proposed in the Thesis. It can be used by SMEs to mimic the use of the intellectual feed-stock, the controller elements, and the drivers. These actions are unconsciously used by the Mind for the generation of innovation-rich, strategy formulation through neurobiological mediation by the Brain.

The scope for success in utilizing the Model therefore depends upon the level of conscious attention applied by the SME with the use of the "Neuro-nouns". It also scales with the extent and the intensity of "Neuro-nouns" and the direct and indirect embedding within the portfolio of new and old business concepts.

SME commitment to the conscious and prolific embedding and deployment of the Neuro-nouns is therefore a pre-requisite for the use of the Model. The aim is to deliver the expected transformation, strategic enrichment and business renaissance necessary for SMEs to sustainably engage with emerging Global Industry Development (eGID) without having to jettison existing knowledge and business frames..

A2.0 Summary: The Thesis has explained how the lessons gained from the science of Cellular and Molecular biology and Neurobiology facilitate "high order thinking" with:
(i) a bio-inspiration framework for catalytic knowledge capture, and also
(ii) a scientific basis for using the strategies that the Mind deploys over the Brain.

It is the foundational neurobiology that underpins and generates all human thought and behaviors. It specifically includes SME Strategy Formulation.

Hence the Model offered in the researched Project offers a framework to imitate, become inspired by, and also deliver a process for innovative higher-order thinking. SMEs are assisted with the Model's check-list of strategic constructs made by experimenting with the Neuro-nouns. Selections need to be made from the portfolio of Neuro-nouns suggested by the Thesis. These need to be integrated and embedded within every stage and phase of the SME business strategy-making exercise. It also applies to the evaluation of existing industry sectors or to developmental activities being planned.

It is in this context that the Appendix outlines a Check List of Methodology for implementing a staged process that seeks to capture the benefits of the Model's catalytic reframing and scientific enhancement of the strategy-making process.

For SMEs this could be a practical "how-to-use" guide for deploying the Research Project's Model to deliver strategic insights, causation-action linkages, innovation value-adders, competitive positioning, and real-time relevance to the needs of the emerging global markets.

SMEs wishing to utilize this "How-to-use" guide are encouraged to refer to the different chapters of the Thesis and their References. This should enable SMEs to obtain a strong footing and intensify the scale and scope of capturing the potential benefits of innovation. The aim is to achieve strategic re-framing with their own portfolio of "Neuro-nouns".

A3.0 A simplified version for using the Model:

Illustrated in Figure A-1 below are the work-flow elements that constitute the Research Project's Model.

Each element within the Model's work-flow / process-stages needs to be "linked" with the relevant "value propositions" that are contained within the portfolio of "Neuro-noun" constructs that have been detailed in the Thesis.

The SME intending to use the Model needs to systematically assess the extent to which the individual "Neuro-nouns" are required for their specific project strategy development and innovation capture.

For example, the business constructs and the strategic frames developed over the past 100-year of business strategy studies and research provide a valuable source of building blocks. Their combination with the Neuro-nouns need to be considered as the natural repositories for strategy making and innovation capture.

The Neuro-noun abstracts need to be considered as the "Innovation differentiators". SMEs need to recognize their potential as value-adders in terms of function, appeal, competitive-edge, and the determinants for achieving true business renaissance.

SME planning to deploy the Model must therefore be committed to both the Neuro-noun abstracts and to the specific project work-flows, functional taks, or process stages requiring embedding of the Neuro-nouns, either in singular or multiple combinations.

SMEs also need to engage the concept of "Chains" to deliver the abstract characteristics or functions of the Neuro-nouns. For example, the "Chain of Integrity" would seek to embed the Neuro-noun of "Integrity" in the entire Supply Chain Network or in different derivatives of the Supply Chain. These could include the SME's role in Demand Driven Supply Chains or in Vendor Managed Supply Chains, or in Agile Chains, or Reverse Logistics, etc.

Figure A-1 outlines the landscape of strategic issues that need to be configured with the Neuro-nouns in the manner that can facilitate implementation of "cycles of analytical considerations" before a final strategy is accepted.

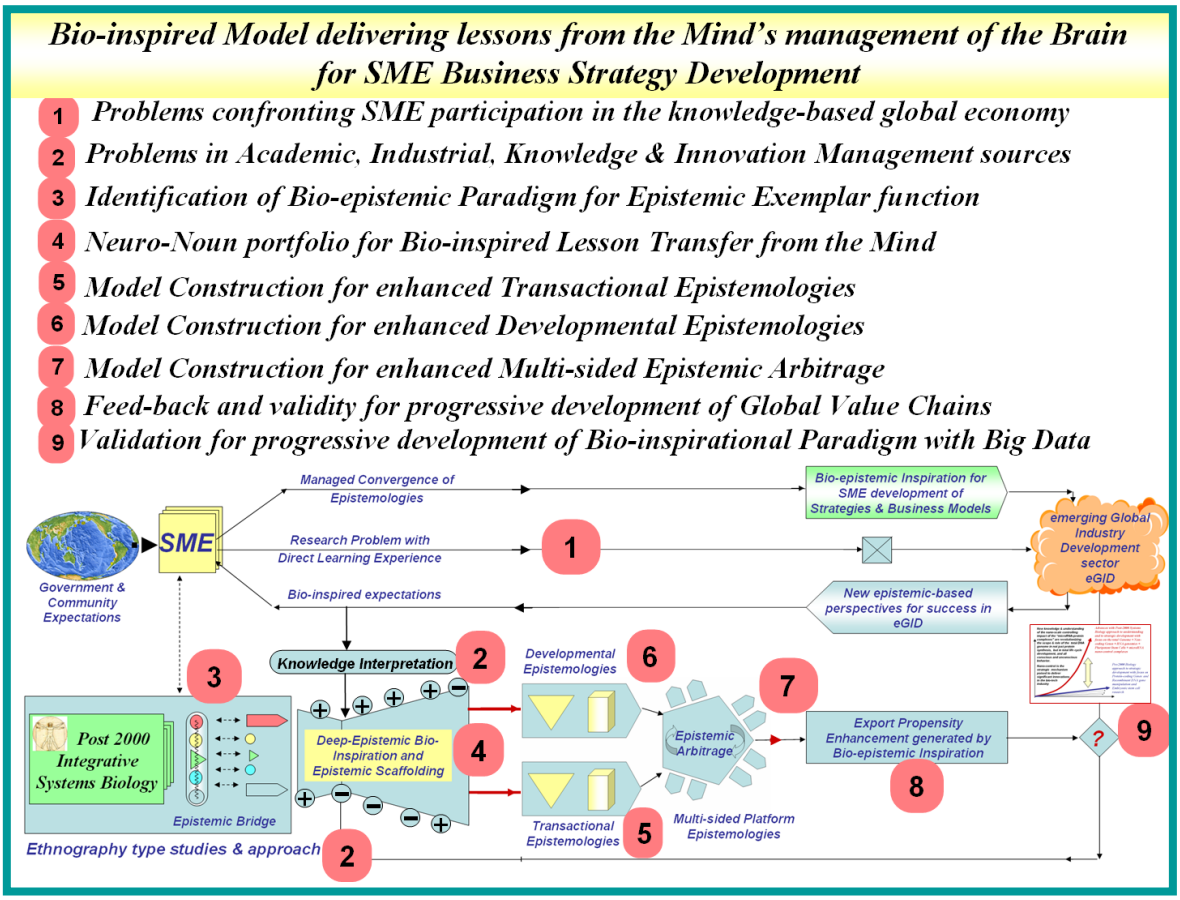

Figure A-1: The work-flow process stages that together make up the Model developed in the Research Project. The implementation instructions refer to the Numbers contained in this diagram.

The Model's utilization strategy therefore involves progressing from the upper Left of the diagrams in Figure A-1, and progressing per the numbered work-process stages, to the lower left before moving across to the right, and finally to the upper right section.
The Appendix also seeks to assist SMEs by segmenting the implementation into 3 phases:
(i) Preparation Phase and gaining background knowledge of the Model's elements, as described within the Thesis and in on-going business models being offered by industry and the academic community;

(ii) Mobilizing a portfolio of project-specific factors and "Neuro-noun" constructs that would need to be "embedded" with the Model's neuro-noun determinants and generators of value and strategic innovation, and

(iii) Interrogating and integrating the mobilized factors and sub-frames with the target Neuro-nouns.

Implementing these steps within the Model illustrated in Figure A-1 requires many "runs" over the entire generic system until the strategic outcomes start to differentiate the "generic starting position".

It is important to further recognize that the Model will require several such iterations of this process and that with each iteration, the strategy can be enhanced with higher levels of innovation.

A3.1 Preparatory Phase for use of the Model:

1. Evaluate and develop the concept that the SME is most likely to embark upon with the strategic intent of engaging with global markets. This is illustrated as **Item 1** in the Top middle of the diagram.
2. Build awareness and internalize the concepts of Protein-coding genes, and the epigenetic Non-protein coding segment of the DNA molecule which resides in every cell of the human life form, but which is most active in the neurobiology of the Mind and Brain during high order thinking as with SME strategy-making. **Item 2** therefore makes the distinction between the "Protein Coding genes" represented by the standard or generic Strategy-making frames or models created over the past 100 years. The Non-protein coding "epigenes" are the new controllers and innovation-seeding mechanisms represented by the portfolio of "Neuro-nouns".
3. Develop commitment, as per **Item 3**, to the scientifically-proven facts (as presented in the Thesis) that the Non-protein Coding "Epigene" (occupying more than 98% of the DNA molecule) is the direct controller of the 1.8% Protein Coding Gene segment of the DNA.
4. Establish as per **Item 4**, the conceptual connection and parallels between (a) the Epigene (and its portfolio of "Neuro-nouns" to function as Innovation-drivers, value adders, and catalyst transformation and strategic renaissance of the generic functioning) and; (b) the Protein-coding genes (represented by the conventional Business Strategy concepts, constructs, and organizational structures).
5. Accept that the Protein-coding genes are generic structures, similar to the 100 years of business models incorporating constructs that need to be "re-framed" and "re-structured" or enhanced for delivery of innovation and relevance in the Emerging Global Industry Development markets (eGID). The user needs to continually re-frame the activities of **Items 1-3** within the context of the interactions between generic-100 year structures (genes) and the "admixing" with the epigenes of the Neuro-noun portfolio within **Item 4**.
6. Visualize and dynamically deploy **Item 4** (as proposed in the Thesis) as the epistemic platform. Figure A-1 uses symbols of + and – signs, to represent the systematic "experimentation that is required in process stage represented by **Item 4**. The Thesis envisages Item 4 as the dynamic platform functioning as an "Inductor-deductor-ejector" catalyzing the generation of new epistemic constructs with progressive and cyclic interactions. Epigenes represented by the + and – signs are the Master Controllers and Monitors of the business Models and Constructs that need to be transformed for strategy and innovation development. The epigenetic-neuro-nouns need to intervene and become integrated and made to function as a strategic form guide.
7. Prepare for decision making on the neuro-noun "convergence" stges. In some instances, the SME needs systematically determine if some of the neuro-noun constructs need to be removed because of their adverse impact on some of their positive parallels. This is illustrated in **Item 4** to represent the need for a dynamic assessment to be made ready before their application over and within the "generic – 100 year old" business models requiring renaissance and a renewed innovation-appeal.
8. Develop a portfolio of the "Epigene-factors" as suggested in the Thesis for their + or – deployment in **Item 4**. The SME needs to visualize and prepare the strategic landscape that needs to be embedded with innovation-determinants and abstract constructs such as

Clarity, Connectivity, Credibility, Integrity, Identity, Mobility, Modality, Modularity, Reliability, Reportability, Spontaneity, Ubiquity, Usability, Validity, Variability, Velocity, Visibility, etc.. The more extensive the development of the neuro-noun portfolio the more effective will be the results generated by Thesis Model.

9. Revert back to **Items 1-4** so that the neuro-noun dynamics in the Model can replicate the action of the Mind over the Brain.
10. Prepare the strategic landscape so that the **Item 4** Platform can simulate and apply these neuronal conditions-of-state.
11. Practice the **Item 4** dynamics to simulate the Mind's actions of executive decision making, memory referencing, reward consideration, decision-making with behavior execution and feed-back.
12. This completes the Preparatory Phase and the Psychological-linkage with the Model.

A3.2 Mobilizing SME-specific factors for application and integration within the Model:

13. Evaluate the Mission Objectives and Strategic Goals of the SME in the context of the firm's plans for business expansion, growth, new market entry, global value chain development, etc. Demarcate the SME-mission and Objectives into 2 further strategic perspectives, (i) whether the Model's strategies will focus on new green-field development, or (ii) Expansion and re-framing of an existing operation that needs a renaissance for survival in the eGID landscape The SME needs to make a strategic assessment at this stage on thestrategic functions relating to innovations within the Transactions delivery system / stage of the business, as per **Item 5**.
14. Evaluate similarly the needs of the target Customer groups in the green-field "Developmental Phase" as per **Item 6** within the Model.
15. Visualize the role of the neuro-nouns in both phases of **Items 5 or 6**. Each requires the integration of concepts such as the Toyota Production System framework, or the Balanced Score Card framework or the Boisot I-space sub-models. For example, the SME needs to seek the "wisdom of the crowd" as in the Toyota Production System to determine the contributions to the neuro-noun portfolio by stakeholders involved with innovation development and the renaissance of the business strategy irrespective of whether it relates to Item 5 or Item 6. Contributions can similarly be made from the Balanced Score Card and the Strategy Maps as outlined in the Thesis. Their Customer Value Propositions need to become part of the portfolio of neuro-nouns. Similarly their Value Propositions can be incorporated in the Boisot I-space within **Items 5 and 6**. By adopting this approach SMEs can achieve specific focus on the potential for delivery of integrated product-services irrespective of whether it is required during the development phase, the transactional phase or both.
16. Develop a Map of the degree to which Knowledge Gaps exist between actual performance / current situation and the expectations of the future per Item 7. This is a further functional platform or landscape to implement the type of "Gap Analysis". **Item 7** aims to facilitate the scoping of what is required from the SME-strategy-making processes, and which needs to be delivered by the Project Model.
17. Evaluate and Map the performance of the SME against the "generic" constructs of the 100-year portfolio of sub-models and frameworks in **Item 7** as the landscape to determine if "multi-modal" strategies can be created. The assessments made in **Item 7** would include the conventional SWOT Analysis, PESTE Analysis, Core Competencies of the firm, the degree to which the firm delivers all of the Porter Value Chain functions, either in-house or by outsourcing, etc. The Multi-sided markets illustrated in **Item 7** can

be better visualized and understood by adding or subtracting specific nouro-noun embellishments so that new product-services can be developed or delivered.

18. Visualize and document in **Item 8** the different derivatives of the multi-sided business models as outlined in the Thesis. These should include Global Value Chains or the Supply Chain Networks, or the Demand and Distribution Networks, or the derivatives of the Value Chain such as the existence of Demand-managed Supply Chains, or Vendor-managed global chains, or Agile outfits or Strategic Alliances, etc.
19. Evaluate specifically in **Item 8** the SME's existing corporate position and its ownership of intellectual capital in relation to the Boisot I-space framework. The X-axis of the I-space 3-d cube relates to the supply chain and knowledge dissemination functions being utilized by the SME, while the Y-axis relates to the Core Competencies and the Explicit Knowledge available to the SME either within or outside of the public domain.
20. Re-evaluate similarly in **Item 8** the SME's advancement and the degree to which it utilizes the constructs of the Toyota Production System, the Balance Score Card and its feed into the Boisot I-space. In particular the Research Project's Model requires the consideration of the Customer Value Propositions, to which the Balanced Score Card and Strategy maps are strategically and physically aligned.
21. Evaluate in **Item 9** the eGID landscape in the context of what "Neuro-noun" characteristics are embedded within the actions of competitors, innovators, new business entrants, and in substitute products (as outlined in the Thesis). Once again and with relevance to the SME's "strategic Intent" utilize analytical studies and findings from Big Data-type initiatives. Maintain the focus of the role of the the Model's Neuro-noun innovation-generators from the perspectives of (i) Global Competition and the creation of Global Value Chains that are being embellished with the Neuro-nouns; (ii) Business Models and variations, and (iii) the deployment of Emerging Technologies relating to Smart Sensors, Wireless communications, Low Energy Technologies, Micro-networks such as Zigbee, Cloud-based platforms, Internet of Things, etc. as outlined in the Thesis. Specifically conceptualize the findings and insights from Big Data science (such as the Hadoop-Spark platforms and their portfolio of Operational functions, Machine Learning, Recommendation Engines, etc) in the context of the Knowledge Gap illustrated in **Item 9**.

A3.3 Interrogation and Intervention Phase of the SME resources and their integration with the Neuro-innovation drivers:

22. The Research Project's Model and its application dynamics are best characterized by the fluid-dynamics principles within an "Induction Mixing Device" or an "Injector Pump" that draws through and mixes fluids to transform and transport them into new zones or systems within a larger machine, and delivering innovation in the process.
23. The intending User must therefore accept that the principle behind the Model's implementation is that all of the SME-resources, the 100-yers of Business Strategy-making constructs, and the expanding portfolio of eGID competition and smart technologies must be "admixed" to transform themselves, from their existing generic and stand-alone nature, to be converted into new "innovation-rich" product-or services.
24. The User of the Model must relate the "strategic admixing" as the Model's mechanisms to deliver outcomes in the form of the portfolio of new product and services, with new

delivery systems, and business support services, and customer co-creations, etc. – all created by their admixing with the portfolio of Neuro-drivers.

A3.4 Cyclic experimentation for integration of the Neuro-innovation drivers until a Strategy-making outcome is developed fro Review:

The Research Project's Model and its application dynamics in Items 1 to 9 are best characterized as an iterative framework. It needs to be subjected to different singular or multiple combinations of Neuro-nouns.

With each cycle, the power of the "Chains of Abstract Value-adders" will become evident.

At this stage the SME may decide to pursue a different portfolio of value adder-combinations. The lack of resources or the physical difficulties in implementing the "embedded Neuro-noun chains" may be the reason for the switch.

As explained in the Thesis, a practical way to determine or select a portfolio of Neuro-nouns is to examine the references made to specific neuro-noun concepts in legal cases or investigatory reports. For example, the reporting on the demise of the Enron Case offers a rich offering of neuro-nouns that were either lacking or over-deployed.

In a similar way, a rich source of neuro-noun references (direct and in-direct) could be found within marketing claims and promotional brochures and "white papers" of digital technologies.

Conclusion:

The strength and success of the Model is conditional upon the intensity with which the Neuro-nouns are embedded and admixed with the concepts, frames, models, and strategies that have been the staple diet of 100 years of Strategy-making research.

The Thesis provides an extensive background of these "diamonds in the rough" that need to be re-framed for their renaissance and relevance in the era Post 2010 global competition.

SMEs planning the use of the Model can be assured that the Neuro-nouns essentially offer a short-cut to access the mind-sets and the decision-making concepts that form part of conventional Consumer Behavior.